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PIERRE A. FISH, Editor **ITHACA, N. Y.**

VOL. LI., N. S. VOL. IV. JUNE, 1917. NO. 3.

Communications relating to membership and matters pertaining to the American Veterinary Medical Association itself should be addressed to Secretary L. A. Merillat, 1827 S. Wabash Ave., Chicago, Ill. Matters pertaining to the Journal should be sent to Ithaca, N. Y.

PROCRASTINATION

Lord Roberts, for years, endeavored to get England prepared for the war, which his clear vision discerned as a possibility. Superior myopic individuals overruled him and as a result England has suffered a serious loss in valuable lives and a great amount of money. Adequate preparation, if it had been made in time, would have saved many of these lives as well as the money. If in 1914, England had possessed one-half of the efficiency she has shown thus far this year, there would probably have been no war or it would have been of relatively short duration and her resources would have been much less impaired.

What Lord Roberts tried to do for England, General Leonard Wood has tried to do for America. No one in this country has had a better knowledge of the conditions of our unpreparedness and it should be to his eternal credit that, so far as he has been permitted, he has done all in his power to prepare and protect this country from the perils that threaten it. Because there have been some atrophied intellects we are in a fair way to render some unnecessary human and financial sacrifices, although endeavoring at the last hour, to avoid so far as possible the mistakes of others.

The British navy and the French and British armies are now practically our first line of defence. We are protected by their sheltering wings and in the meantime we are leisurely taking measures to protect ourselves.

Involved in the general dilatoriness is the army veterinary service. There have been prophets among the veterinarians. Some have been clear sighted enough to see that the present service was entirely inadequate for any sudden expansion of the army and have endeavored to provide against such a contingency. The danger of unnecessary loss of animal life and the money involved is comparable with the human loss. Those who would avert this are bound by the red tape of inactive legislation. Years of effort have been spent in securing proper recognition for the services of the army veterinarians, but further recognition for a veterinary reserve corps for animal relief, which in time of war would seem to be just as essential as a medical reserve corps for human relief, has not as yet received definite legislative sanction. With the greatly increased size of the army, hundreds of additional properly qualified veterinarians will be required. It is very improbable that this country can begin to supply the necessary number for the regular service with its rather rigid tests and restricted age limits. It is only through a reserve corps, in which the tests and the age limits are more elastic, that it can be hoped to secure the number needed, and since the work is so similar it is only reasonable to expect that this corps should be established on lines similar to those of the medical reserve corps.

It is reported that this government is basing its plans, not upon a speedy termination of the war, but upon the possibility that it may continue one to three years longer. This seems to be a wise provision and it would seem to be equally wise, so far as the veterinary branch is concerned, that if a right start is effected, fewer mistakes will be made; fewer losses will occur and fewer regrets will arise to reproach us for past inefficiency.

It is also reported that England is calling for more veterinarians, although the number she has in the field overwhelmingly overshadows our own supply. If the war continues much longer, as indications seem to show that it will, many more veterinarians will be needed here, and in the general scheme of preparedness it should be the duty and the effort of the veterinary colleges to meet this demand by supplying as many properly qualified graduates as

may be required. The demands of war are oftentimes sudden and imperative. There are also civic demands to consider, for all veterinarians can not go into the army. The non-enlisted veterinarian may render valuable service to his country by striving, as never before, to conserve the health of the stock in his community and to assist in safeguarding and augmenting the food supply upon which the armies and non-combatants must depend.

P. A. F.

THE VETERINARY RESERVE CORPS

An editorial in the May number of this Journal calls attention to a very serious situation in the lack of a Veterinary Reserve Corps in the United States Army. It appears from that editorial that young men, 21 to 27 years old, may enter the army service as veterinarians with the rank, pay and allowances of second lieutenants, but that the more experienced and more mature veterinarians who are more than 27 years old can only enter the veterinary service with the pay and allowances of a second lieutenant, but without rank. The situation thus created is so impossible and so absurd that the writer of the editorial referred to comes to the distressing conclusion that veterinarians over 27 years old who wish to serve their country should enter the infantry, cavalry or some other branch of the service, but not the veterinary service.

If the present situation is unalterable, this conclusion is probably sound. In a world in which rank is an accepted institution, there are positions in which rank becomes vital and essential.. Disregarding the fact that rank is superficially regarded as something that carries certain rights and privileges, insignia and other trappings—things dear to the heart of the average person, even to most of the democratic souls that openly scorn such baubles,—the fundamental and essential purpose of rank is to give authority to those who assume the responsibility. The care of the army horses of the republic is a big responsibility, involving a large monetary investment—with all that such investment means in taxes to pay the bill, and carrying with it the possibility of victory or defeat in the form of cavalry well mounted or cavalry handicapped or disqualified for service by horses out of commission. The veterinarian does not stand in a purely advisory relation to these horses; neither is he a stable hand. His position is an executive position

with responsibilities for results. It is absolutely essential that he be in a position to take measures to secure these results, unhampered by whim or interference on the part of persons who have authority over the veterinarian without responsibility for the veterinary results.

The long story of the effort of American veterinarians to secure some small measure of the rank and recognition that is accorded veterinarians in the European armies and in that of our Canadian neighbors, need not be reviewed here. I have been told by a former veterinarian of our army that most of the opposition to that recognition came from the line officers; I have been told by an officer of the medical section of the Officers Reserve Corps that the Medical Corps has fought the recognition of the veterinarian. Granting all this, there is nothing to be gained by throwing bricks at the officers of the line or of the medical service; they are excellent and able men in their own lines. We are confronted with a situation which is not academic to begin with and which will become less so. Is there anything we can do and should do at this time?

Less than a year ago, Congress granted to the veterinarians in the army the privilege of rank, cautiously limiting them to the grade of major after 20 years of service. It appears that men over the age of 27, and even in times of peace this age limit is too low, who might enter the veterinary service in case of war, have in some way been left in the position of the army veterinarian up to a short time ago, i. e., without rank. Now we are actually at war, this absurd situation has just come to light, and one of the most prominent veterinarians in the United States advises us to enter the army in some branch other than the veterinary service if we wish to serve the country. It is in some ways an attractive proposal. By entering an officer's training camp now, one may prepare for service as a line officer with no limit to his possibilities for promotion except his own ability; by going into the veterinary service he becomes neither an officer nor an enlisted man, an attractive prospect for the able and distinguished veterinarians of the United States who are invited in these terms to serve their country by putting their skilled services under the command of their recent students, to give up their practices at the sacrifice of thousands of dollars to take the pay of a second lieutenant without even the rank. It is as true in war times as in peace times that the

laborer is worthy of his hire. The line officers and the medical officers are jealous of their rank and would sacrifice it under no considerations. Why should this sacrifice, with the entailed handicap of ineffectiveness, be demanded of the veterinarian?

But while Dr. Marshall's proposal that we enter the army and avoid the veterinary service is attractive, there are fundamental objections to it. We have learned from Europe's experience the disastrous effects of putting men of special training in the ranks of the fighting forces and withdrawing them from positions where they cannot be replaced. Veterinarians are men of special training; they cannot be replaced as veterinarians overnight or out of hand. Nor is the supply of veterinarians so abundant or the qualities demanded of an army veterinarian so common that this country or any country can afford to sacrifice their services by putting them in the fighting lines. During the first two years of the present great war, the German veterinary periodicals carried every month a list of German army veterinarians killed in action and a list of those that had received the Iron Cross or similar decorations for conspicuous bravery; each of those monthly lists was about as long as the total roster of all the veterinarians in our army; and this was for the German army alone and for men acting in their capacity as veterinarians. Unquestionably the list would have been a much longer one had Germany allowed her veterinarians to do what Dr. Marshall proposes—enter the army as line officers.

At the present time the Veterinary News of London is carrying the following advertisement: "Army Veterinary Corps.—Veterinary Surgeons under 50 years of age are most urgently needed for temporary commissions in the Army Veterinary Corps for service at Home and Over Seas. For particulars apply to Director-General, Army Veterinary Service."

England and Germany, employing their veterinarians as veterinarians, and granting them ranks up to that of general, are short of veterinarians. What does that mean? It means that the horses of the cavalry and field artillery are going unattended or receiving inadequate attention, thereby weakening the efficiency of these arms of the service, that the live stock interests of these and other countries are being inadequately attended to as a result of a shortage of veterinarians, the men trained to attend to these interests. Are we to repeat this experience and intensify it by

taking our services entirely out of the veterinary field and incurring the additional losses that will come from service on the firing line instead of the veterinary service, where European experience indicates that the losses will be severe enough? It does not appear that this is the proper and logical thing to do. Congress is in session and in the mood to consider army legislation; it has been impressed with the need of conserving human and material services and utilizing them where they will be effective; it is apt to listen to proposals for increasing efficacy. A determined effort now to save the services of veterinarians to the country and not waste them by allowing veterinarians to serve their individual interests by entering the line service, may easily lead to valuable and much needed amendments. Even the recognition granted army veterinarians in the recent legislation is inadequate. If we are to have a real war, as it seems we will, it will develop that we have no machinery adequate to cope with the situation as regards care and handling of sick and wounded horses; our veterinarians haven't the assistance that would be essential. A veterinary unit at the front in Europe is composed of about 100 men; we have nothing resembling this.

The special committee of the A.V.M.A. on Army Veterinary Service has conferred with the authorities in Washington and is still using its best efforts to get Congress to write into its laws the suggested amendment providing for a Veterinary Reserve Corps and for an extension of rank that will be more in keeping with the needs of our proposed army and more nearly the recognition which is accorded veterinarians everywhere except in this country. Every veterinarian should write his senator and congressman, asking for these rights. There has been enough discrimination. The American veterinarian is as able and effective as the European. Should we be less intelligent and considerate than Germany, or France or England? Now, when the country is in need of everyone's services, before mistakes are made and veterinary services irretrievably lost, is the time to put the veterinary service of the Army in shape to use and even to attract trained and mature men, at least when war makes it imperative.

M. C. H.

THE VETERINARIAN AND THE FARMER

There has always been a bond of mutual dependence between the veterinarian and the farmer, because the latter is the producer of the patients and the former is often times able to preserve their existence. In a general way their interests are mutual and there should also be a bond of sympathy and trust. As veterinary practice has shifted more and more from city to country limits these bonds have been strengthened. These are general principles but they are more or less influenced by the personal element of the practitioner and client. The question has been so ably discussed recently from the farmers standpoint and given a wide circulation in one of the prominent influential agricultural papers, thereby reaching a large clientele, that it seems equally desirable that some of these excellent views should also be brought to the attention of the veterinarians. The author is so fair minded and free from bias and presents his opinion so lucidly that we shall feel at liberty to quote his statements quite freely.

He establishes the general principle that if worthy of his calling, the veterinarian as well as the stockman must be a lover of animals. Stockmen are demanding a higher type of veterinarian than has been required in the past. The farmers of today are also of a different type from those of the past. Many of them are quite well versed in the cause and cure of disease. When a veterinarian states that navel ill in colts is inherited directly from the dam and that it does not come from infection, the farmer is made skeptical of that man's professional ability and is likely to call a man to treat his animals whose ideas conform to modern standards.

The really successful veterinarian is a stockman at heart. He should be familiar with the ups and downs of the business; with the problems of marketing and feeding, and should be in sympathy with all progressive movements concerning live stock. He should "boost" for the live stock show or for the breeder's club and participate in public affairs. The veterinarian who has been farm-reared has an advantage. The modern veterinary college gives as part of the prescribed curriculum, courses in breeding, feeding and management of live stock and in stock judging.

The veterinarian who takes his farmer patron into his confidence rarely loses by so doing. More likely is he to gain by it. The author had occasion to visit farms with veterinarians. Recent-

ly in company with a young practitioner he called at a farm and the farmer asked the veterinarian to examine a young mare in his barn. The veterinarian explained the condition fully and informed the owner of the mare that the condition was rather serious but would yield to treatment. He instructed the young farmer how to treat the case and said that it would not be necessary for him to call again unless some unforeseen complications should set in. The farmer was highly pleased and has become a very enthusiastic supporter of the young veterinarian whose practice is growing rapidly.

In contrast to this method is another who would seem to have been well qualified for the work of a veterinarian. He held that it was utterly inadvisable to give the farmer any information that might enable him to treat his own animals or to assist in any way in handling the case. He would talk freely concerning any other subject, which in itself led the farmer to feel that the veterinarian's first interest was not with his live stock. The practice of this particular veterinarian never grew to any extensive proportion. Finally he decided that conditions were against him and left to take up practice in a new location. Each veterinarian must contend with the parasite who would treat his animals from advice he would obtain free. Tact and diplomacy are necessary on the part of the veterinarian, and it is a hopeful sign that the great majority of stockmen are very willing to pay for the professional service.

Stockmen prefer the veterinarian whose integrity is unquestionable. It is observed in the examination of stallions for state enrollment that the veterinarian who will allow nothing to influence his judgment is the one whose services are in demand when an emergency arises. The veterinarian who might overlook an unsoundness or abnormal condition for the sake of retaining the good feeling of a patron is very likely to lose rather than to gain. In one instance a stallion was taken to a veterinarian who pronounced him unsound. The owner said that the unsoundness should not be mentioned in the veterinarian's affidavit. The owner finally grew angry and took the stallion to another practitioner whose scruples, apparently, were not so pronounced. Shortly afterward the owner decided to have the stallion castrated. For this work he called the veterinarian who had refused to overlook the unsoundness, thus showing that for critical work he preferred a man who had shown himself to be square and honest.

The farmer has his limitations in treating his farm stock. There are many things he is able to do and doubtless in some he may well be encouraged by his veterinarian. The wide-awake stockman knows it is to his best interests to call a veterinarian. The better posted he is the fewer mistakes he is likely to make. He will not often call a veterinarian except when actually needed. He will not delay calling him in time of actual need. The country is becoming more and more filled with progressive farmers and progressive veterinarians. The reliance upon each other is a necessary feature of progress in stock breeding.

To succeed in a community the veterinarian must have, at least, a general education equal to the average of that community, higher than the average will be better, particularly if he is to take a commendable part in public affairs. In his professional capacity his knowledge must be much superior to that of his clients. The combined knowledge with the proper admixture of tact and diplomacy and last, but not least, unimpeachable integrity, spells success.

P. A. F.

INFORMATION RELATING TO APPOINTMENTS IN THE VETERINARY RESERVE CORPS OF THE ARMY

The National Defense Act of June 3, 1916, and the tentative regulations thereunder, provide for a veterinary section or branch of the Officers' Reserve Corps. The officers of the Veterinary Reserve Corps have the rank of second lieutenant, and are appointed and commissioned by the President, after having been found upon examination prescribed by him physically, mentally and morally qualified to hold such commissions. Commissions are issued for periods of five years, at the end of which time the officers may be recommissioned subject to such further examinations and qualifications as the President may prescribe. They are subject to call for duty in time of actual or threatened hostilities only. While on active duty under such call they are entitled to the pay and allowances (including quarters, fuel and light) of their grade. They are entitled also to pension for disability incurred in the line of duty and while in active service. They are not entitled to pay or allowances except when in active service, nor to retirement or retired pay.

Appointees must be citizens of the United States, between 22

and 55 years of age, must be graduates of recognized veterinary colleges or universities, and must, at the time of appointment, be in the active practice of their profession in the States in which they reside.

The examination is physical and professional. It is conducted by boards consisting in each case of one medical and two veterinary officers of the Army, designated by the War Department.

The examination as to physical qualifications conforms to the standard required of recruits for the United States Army. Defects of vision resulting from errors of refraction which are not excessive, and which may be entirely corrected by glasses, do not disqualify unless they are due to or are accompanied by organic disease. Minor physical deficiencies may be waived.

The professional examination will be oral. If the applicant fails therein, he may if he desires have a written examination. An average of 75 per cent is required to qualify in the examination. The examination comprises the following subjects: 1. General anatomy; 2. General pathology, therapeutics and surgery; 3. General bacteriology and parasitology; 4. Hygiene, including feeding and watering, stabling, heat and light, and ventilation.

Applications for appointment in the Veterinary Reserve Corps must be made in writing, upon the prescribed blank form, to the Surgeon General of the Army, Washington, D. C., who will supply the blank upon request. The correctness of the statements made in the application must be sworn to by the applicant before a notary public or other official authorized by law to administer oaths. It must be accompanied by testimonials based upon personal acquaintance, from at least two reputable persons, as to the applicant's citizenship, character, and habits, and by his personal history given in full upon the blank form furnished him for the purpose.

EUROPEAN CHRONICLES

Bois Jerome.

THE TREATMENT OF CARTILAGINOUS QUITTOR.—Is there a surgical disease in veterinary medicine upon which as much or more has been written than cartilaginous quittor and its treatment? The severity of the ailment, the complications that may accompany it, the long time in which animals affected are disabled and the *many*

means that have been promoted, advocated, praised and then laid aside, have justified all the efforts to reduce to the minimum the consequences of its presence on the feet of all kinds of horses.

Could more be written on the subject? At first thought, one will answer in the negative; yet, in the *Revue Generale* of Panisset, of the 15th of January a veterinarian, attached to the Belgian army, Mr. J. Hamoir has published a very long article on the subject, where criticisms are made of the treatment and another is recommended as superior to all the others.

The treatment can be summarized, according to the writer, into two principal methods: in one, the object in view is the delimitation and elimination of the necrosed structure which is looked for in the use of the various potential caustics, the actual cautery, the cauterizing injections and principally the use of Villate Solution. In the other method, which is exclusively surgical, the object is the eradication of the necrosed tissues and more commonly the total removal of the diseased part.

The author considers the latter method first, viz: the operation for the removal of the lateral fibro-cartilage as known by all veterinarians, the removal is accomplished by four different methods. 1st. The wall of the quarter or the classical operation; 2nd. The wall and the coronary skin, method of Bayer, and Schroeder; 3rd. The plantar surface of the heel and sole, method of Chuchu; 4th. The coronary cutaneous covering, method of Perrier.

The description and modus operandi of these four methods are then considered by the author and illustrated. Each one is subjected to criticisms, which can be readily understood and have probably been observed by those who have resorted to these various processes. One is especially explicit and refers to the method which advocates a partial removal of the cartilage. *Never make a partial removal, but always perform the total operation.* Of course this applies only to the cases where the operation of ablation of the lateral fibro-cartilage is resorted to.

The sequelae of the operation of this first mode of treatment are considered. Regeneration of the fibro-cartilage, lameness following the cure from the quittor, pedal osteitis, etc.

After these considerations the author takes the method of caustics and escharotics in hand. He is brought to the presentation of a mode of treatment which he does not claim as his but has seen it applied and has resorted to it himself with what he considers great success.

In his own words, he says: "The technic of this treatment is this: no special education, no complications, no instrumentation is necessary; only a blunt pointed cautery and a glass syringe.

"A grooved director is introduced in the fistulae (single or many) so as to ascertain the direction and depth to which the actual cautery must be introduced. Red heated, this is pushed rapidly in, two or three times. The next and following days, with the syringe and a strong pressure, every cauterized orifice receives a full measure of Villate solution.

"The results of the injections are then described. First, the suppuration is more abundant, then it becomes mixed with pustulant, grey-yellowish casts, the disintegration of the necrosed tissues takes place. The pus diminishes gradually. After eight days the morbid secretion has ceased and it is very rarely that a second cauterization is required."

A résumé of the cases recorded in the article of the *Revue Generale* will tell of the value of the method, advocated by Mr. Hamoir, at least as far as the *average duration* is concerned.

The cases recorded are divided in three classes taking for a basis the prognosis of the cases.

1—*Benignant Cases*—Simple or incomplete fistula with lameness, slight or not severe:—14 cases—Recoveries in 3 weeks, 18 days, 20 days, 5 weeks, 16 days, 1 month, 13 days, 21 days, 46 days, 1 month, 22 days.

2—*Severe cases*—with complete or multiple fistulae, with or without lesions of the coronary band. Deformation of the coronary band—severe lameness. 12 cases recovered, in 26 days, 33 days, 20 days, 16 days, 12 days, 1 month, 8 days, 18 days, 25 days, 13 days, 23 days, 20 days.

3—*Complicated Cases*—Only two cartilaginous quittors following a suppurative corn, one in a neurotomized mare, destroyed because of extensive complications. The other quittor complication of canker, had to be finally operated by the classical method. It is the only subject which resisted actual cauterization and injections of the Villate solution.

I have tried as concisely as possible, to do justice to the article without taking more space than such analysis would permit and at the same time offer to our readers all that the article of Mr. Hamoir presented of interest. In concluding, however, I cannot but ask myself if there is entire originality in the *new* treatment advocated

and if I cannot recall years and years ago, at least very similar treatment performed and recorded in the United States. Perhaps some of our older readers may.

REPORT OF THE CHIEF OF THE BUREAU OF ANIMAL INDUSTRY.—I have been favored with this official document which contains the activities of the Bureau for the year ending June 1916.

It is presented by Dr. Melvin and offers to the attentive observer in a concise manner the enormous amount of work done by this branch of the Department of Agriculture in the United States.

The first pages of the report relate to a few diseases that required the attention of the Bureau. Remarks are offered on the problem of foot-and-mouth disease finally eradicated after the slaughter of 172,222 animals, of an appraised value of nearly $5,000,000. Then of the progress against hog cholera where the application of serum has been extensively used. Then on the tuberculosis problem which demands "that the first steps should be taken to spread among the people concerned a knowledge of the facts as to the nature of tuberculosis, how it is spread and how it may be prevented"—and finally on hemorrhagic septicemia, which has been the object of special attention by the Pathological Division of the Bureau with Drs. Mohler and Eichhorn at the head of the division.

Following this, the report takes up the work of the various divisions of the Bureau.

That of *Animal Husbandry,* under the direction of Chief George M. Rommel, where are considered his numerous investigations relating to the species of domestic animals.

The *Dairy Division,* Dr. B. H. Rawl, in which the significant new features are the growth and interest in the manufacture of dairy products in the various states.

Meat Inspection has for its chief Dr. R. P. Steddam, whose functions will be readily appreciated.

The *Field Inspection Division* has Dr. B. A. Ramsay for director. Besides the work of eradicating foot-and-mouth disease carried on mostly through that division, it has also worked on the eradication of other plagues, that of southern cattle ticks, of sheep, cattle and horse scabies, etc.

The *Quarantine Division,* with Dr. R. W. Hickman at the head, has had much to do with the number of animals imported,

quarantined and tested with tuberculin. The eradication of dourine has also occupied the workers of that division.

In the *Pathological Division,* Dr. A. Eichhorn is found as the chief. The work done by that division is enormous. As indeed is shown by the many bulletins issued by the Bureau from its reports, on investigations on anthrax, cerebro-spinal meningitis or forage poisoning, dourine, glanders, hemorrhagic septicemia, infectious abortion, etc., etc. The list is too long to be referred to in such a short notice.

The *Biochemic Division,* with Dr. M. Dorset as chief, refers to research work on hog cholera, on the virus-serum-toxin, on the distribution of tuberculin and of mallein, etc.

In the *Zoological Division,* the chief, Dr. Ransom, has made reports on the work relating to roundworms of sheep, on the treatment and control of external and of internal parasites, of parasitic protozoa, etc., etc.

Under the heading of Miscellaneous Division Dr. A. M. Farrington, who is the chief, refers to the valuable changes in the veterinary colleges, in which the course of studies has been raised from 3 to 4 years' attendance.

Finally, the work of Dr. E. C. Schroeder, the superintendent of the *Experiment Stations,* is referred to in relation to infectious abortion in cattle and to tuberculosis. The conclusions relating to infectious abortion can be summarized from the principal facts discovered or proved to be true as follows:

"1. That infected cows often remain carriers of the bacillus of infectious abortion disease, long after they have ceased to manifest symptoms of their infected condition.

"2. That cows which have never aborted and regularly produced seemingly normal calves may be chronic carriers and disseminators of abortion bacilli.

"3. That the habitat of the abortion bacillus in the bodies of infected cows that are apparently healthy is the udder.

"4. That the infection in an infected herd may be limited to a single quarter, or may exist in two, three or all quarters.

"5. That both the milk and the blood serum of cows with infected udders invariably agglutinate suspensions of abortion bacilli.

"6. That colostrum from cows with infected udders has an enormously high agglutinating potency for abortion bacilli.

"7. That the agglutinating potency of the blood serum of a

pregnant cow is not a reliable measure of the probability of an abortion or a normal parturition.

"8. That careful tests made with blood, the heart, liver, kidneys, lungs, spleen, lymph glands from all portions of the body, nerve and brain tissues, muscles, uterus, ovaries, etc., from cows infected with abortion bacilli have failed to reveal the presence of the bacilli elsewhere than in the udder, supramammary lymph glands, rarely in some of the lymph glands of the pelvis and in the uterus only near the time of an abortion or at parturition.

"9. That the abortion bacillus is an organism which is amazingly resistant to natural germ-destroying agencies.

"The best known means of guarding against the ravages of this serious disease is the proper use of the agglutinating test, which is very reliable and not expensive. The test should be applied to every new animal purchased before it is permitted to come in contact with the uninfected herd. The chronic carriers of abortion bacilli which we have proved to be numerous must be regarded for the time being as the greatest menace against which the herd should be protected so far as this disease is concerned and the agglutination test has a high potency in detecting such chronic dissemination."

TETANUS TREATMENT.—I would not be surprised if after reading this title, some of our readers would exclaim: "*Why, again a new treatment!*" They would certainly be justified as it is of a new treatment, based on the modest claim of a contribution to the treatment of tetanus by Major Veterinary Rocher, that this extract is made.

It is well understood that practically everything relating to tetanus has been written concerning the disease in all its forms, its manifestations, its various assumptions, its positive diagnosis, its almost always certain, fatal prognosis and its treatment preventive and curative. Everything relating to it has been extensively considered and has found in scientific publications the publicity that the subject deserves.

And yet, the contribution of Mr. Rocher cannot be allowed to pass on merely the single acknowledgement of a case. Why? Because, though only a contribution, it has a value of its own; one that the daily practitioner can scarcely be justified in ignoring.

The reading of the case as described in the part of Pathology and Therapeutics of the *Recueil* of December 1916 will determine if I am overrating the said contribution.

A mare had a slight injury of the coronary band on the external face of the right fore foot. This wound was simple, was dressed with tincture of iodin, no preventive injection of antitetanic serum was made, cicatrization was normal in a few days. Thirteen days later the mare was laid up and on the following day a diagnosis of lock jaw was made without difficulty. All the symptoms were well characterized and the development was rapid. Notwithstanding the treatment of antitetanic serum injections and enemas of chloral repeated four times a day, the generalization was such and progress of the disease was so rapid that a fatal termination was looked for in a short time.

In the presence of this condition, on the fourth day of the disease, one gram of the aqueous solution of hydrobromide of cicutine, in five syringe doses of five c.c., or 20 centigrams in each, was injected into the mare.

On the next day some hope was entertained. The head was moved more easily, so were the jaws. The day following the improvement was still more marked, the mare took some food. On the fifth day from the beginning of the treatment the tetanus was in complete regression. The trismus had disappeared, the jaws moved freely and the mouth opened and closed without difficulty. Labial prehension was possible, the neck was free in its movements, and the legs had more suppleness.

The injections were stopped. Those of chloral only were kept up for a few days longer. The *Cicutine* treatment was started on the 3d day and stopped on the 7th day of June and on the 13th the animal was in full convalescence. It seems proper to conclude that the recovery had taken place in less than 10 days.

The action of the cicutine on the effects of the toxin of the bacillus has in this case been extremely marked, especially in taking into consideration the severe exacerbations of the symptoms.

The drug is deserving of further use.

Riziform Granular Cysts.—Do they always indicate a tubercular infection? That is the question which appears in a communication made before the Society of Comparative Pathology in Paris.

Known for a long time in man, where they have been the object of close investigation, these cysts are less common in animals or, at least says Mr. Bissauge, our literature is almost mute on the subject.

From the surgical point of view, these cysts have not a very great importance in veterinary medicine, their treatment is the same as that for other cysts.

In human medicine, riziform granular cysts of synovitis, of the digital sheath of the flexors or extensors of the palm of the hand, etc. are considered as tuberculous lesions, perhaps attenuated in form, very slow in resolution, and occurring in subjects generally strong and resistant.

Histology, experimentation and clinical observations have established the undeniable tuberculous nature of them.

In man, as in animals, these cysts have generally an elongated form, if they develop in tendinous cul-de-sacs or again some have peduncles which, in time, permits their separation from the synovial sac to which they belong.

In horses, when the cysts are not synovial, as those occurring by the repeated friction of harness or any spot on the skin, on the outside of joints, their form is spherical or more or less elongated.

Their characteristic lies in the nature of their contents; when punctured there escapes a thready, oily fluid, yellowish or slightly reddish, in which float a more or less abundant quantity of small grains varying in size, difficult to crush, with a smooth surface, or slightly flattened.

In some cases, the grains are collected in small masses, as big as a hazel nut and again in others they are perforated in the center resembling the beads of a chaplet.

In old cysts, the fluid has completely disappeared and the cavity is full of riziform granules.

The walls of the cysts are either smooth and polished or covered with fibroplastic elements in lamellae or bands.

In both human and veterinary medicine riziform granular cysts are absolutely identical: the external aspect, the contents, the walls are the same and similar treatment can be applied and followed by the same results.

But, the tuberculous origin, so well established in man, does not seem to be accepted for animals, at least in this day. Hence the question asked by the author, after recording a few doubtful

cases, where the presence of the cysts promoted successful surgical interference, without the possibility of ascertaining if the animals operated on had tuberculosis or not. They all made a radical recovery.

SUMMARY FROM RECENT PUBLICATIONS RECEIVED AND BIBLIOGRAPHIC ITEMS*

ANNALES DE L'INSTITUT PASTEUR.—(X) Researches on the virulence of muscles and lymph glands, apparently healthy, in generalized tuberculosis of cattle and of swine. (X) On the post series tetanus.

REVUE DE PATHOLOGIE COMPAREE.—(O) Treatment of eczema in dogs. (X) Treatment of epizootic lymphangitis by autopyotherapy.

RECUEIL DE MÉDÉCINE Vf ÉRINAIRE.—(X) Vocal cord and ventricle of the glottis. (X) Urethro-cutaneous sutures in amputation of the penis in horses. (O) On sand colic. (O) Enormous coccygeal arterio-venous dilatation in a steer. (O) Mycotic pseudo-tuberculosis in a South American horse.

VETERINARY JOURNAL.—(X) Our 500th number. (O) Interesting case of uterine eversion and milk fever. (O) Interesting shrapnel injury. Bacterial necrosis in the horse. (O) Uterine eversion in a mare. (O) Punctured wound of the hock in a cart mare. (O) Pruritic dermatitis by infection of mange from cat.

VETERINARY RECORD.—Unusual accident. (O) Fracture of the pedal bone. (O) Rupture of the uterus in a cow. (O) Curious lameness implicating levator humeri. (O) Internal strangles.

VETERINARY NEWS.—Hospital observations on the mule. (O) Complications. Quittor. Clinical notes.

LA CLINICA VETERINARIA.—Studies on the hygienic production of milk. Some remarks on anthrax.

CORNELL VETERINARIAN.—Control of tuberculosis, abortion and calf scours in a large dairy herd. Reports on clean milk. Diagnosis of open cases of tuberculosis. Suppuration in cattle and swine by Bacterium pyogenes. Great nematode in the abdominal cavity.

A. LIAUTARD.

*Titles marked "X" will be summarized. Those marked "O" will appear as abstracts.

—It is reported that Dr. L. E. Northrup, as state veterinarian of Indiana, in an effort to increase live stock production, has offered his services as a distributing agent for farmers wishing to dispose of hogs weighing 100 pounds or less, to purchasers who will fatten them and that he will vaccinate all hogs for cholera and dip them to prevent other diseases.

HOG CHOLERA TRANSMISSION THROUGH INFECTED PORK*

R. R. Birch, Ithaca, N. Y.

There is no other acute infectious disease of animals which is so widespread as hog cholera. It occurs in almost, if not quite, all countries in which swine are raised, and in some countries there are few large areas entirely free from it. While it is most prevalent near the more important shipping routes and in localities where large numbers of hogs are raised, it nevertheless appears frequently on remote farms and in localities far removed from busy traffic routes and centers. Its appearance in these seemingly well isolated places has been puzzling, for it is well known that it is caused by a specific virus, and that whenever it appears in a herd, the virus has in some manner been transferred to the herd from other infected animals.

Hog cholera virus, while it is not known to multiply outside the bodies of swine, is very tenacious and resists most natural destructive influences for long periods of time. A very small quantity[1] of it will infect an animal, and it is, therefore, commonly supposed that such casual carriers as crows, buzzards, and also various domestic animals not themselves susceptible to hog cholera, are in a large measure responsible for the many seemingly mysterious appearances of the disease. While the facts at hand do not admit doubt concerning the possibility of hog cholera virus transmission by these carriers, there are good reasons to doubt whether they possess the degree of importance usually attributed to them. Circumstances seem to point to some important means of transmission less precarious than is furnished by such carriers.

Hogs that are fed garbage very frequently contract cholera and garbage often contains pork trimmings. Since garbage feeding is habitual both with farmers who feed only their own kitchen refuse and with men who make a business of removing and feeding city garbage, it seems reasonable to suppose that this practice may

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1. King places the minimum fatal dose of hog cholera virus for a 50 lb. pig somewhere between 1/215 and 1/300 c.c. In his experiments the doses were administered intramuscularly.

be responsible for many new herd infections. Further evidence supporting this belief is found in the facts that marketing the seemingly well animals in newly infected herds is a common practice, and that hog cholera virus appears in the blood stream of infected animals quite early in the course of the disease.

In the past, very little importance seems to have been attached to the transmission of hog cholera through infected bits of pork. Dr. James Law[2] mentions pork trimmings as a possible source of infection, but he lays special stress on dangers incident to feeding slaughter house refuse. Hutyra and Marek[3] make no mention of market pork as a possible means of hog cholera transmission, and neither do Friedburger and Fröhner[4]. Dr. M. Dorset[5] in summarizing the various channels of inter-herd spread of the disease makes no mention of infected pork trimmings. So far as we know the first outbreak traced with any degree of accuracy to infected market pork was one in Canada which McGilvray[6] reported in 1912. Even that outbreak seems to have been regarded as an exception for very little has been done looking toward the prevention of this means of hog cholera transmission.

Anti-hog cholera serum has removed one of the greatest obstacles in the way of hog cholera control. Not only does it protect herds in which the disease is just starting and prevent its appearance in other threatened herds, but it prevents, or should prevent, these herds from being shipped to market at times when they are in condition to infect other swine. It thus removes an almost unbearable hardship to swine breeders that otherwise would accompany the enforcement of strict sanitary measures to prevent shipping cholera infected hogs. It has given good reasons to hope for the more complete control or eradication of hog cholera, and in so doing it has centered the efforts of a large number of veterinarians on a more thorough study of the disease itself, and on sanitary measures for its control. Since it cannot be effectively controlled as long as any one common means of transmission remains unknown or unheeded it has seemed desirable to procure exact experimental data on the effects of feeding susceptible pigs bits of pork such as might be found in garbage.

The experiments have been conducted with three kinds of pork; fresh, refrigerated, and cured. Some of the specimens of each kind were taken from carcasses that would have passed inspection, and others were taken from carcasses that would have

been condemned. In all the experiments, before the specimens were removed for feeding, the hams were scalded and scraped as is done in butchering. Except as otherwise stated the material fed consisted of all or a part of the head of a femur together with adjacent parts. With one exception, experiment No. 1 in table No. 2, the hams all came from small shoats weighing less than one hundred pounds each, a fact which might have considerable influence on results obtained from feeding cured pork. Large hams would naturally be expected to harbor virus in their depths with somewhat greater regularity than small ones when both are subjected to killing influences that work from without.

The susceptible pigs to which the pork trimmings were fed were isolated with great care. In the earlier experiments small fly-tight pens were constructed of screen and matched lumber for this purpose. These were located on a hill several hundred feet from hog yards of any kind. When infection occurred in a pen it was immediately burned, and a new one was constructed on fresh soil for further experiments. The pigs fed in later experiments were placed in small individual fire brick pens so constructed that the attendant could not touch the pigs within. Food and water were introduced through a joint of tile. After each experiment the pen used was cleaned out and a wood fire was kindled inside and allowed to burn for several hours. Thus, in all cases heat, rather than disinfectants, was used to destroy the virus. Most of the pigs were isolated a week or more before being fed and in no case did disease appear previous to feeding. In all cases the experimental pigs were selected from a herd of susceptible animals, and, except as noted, disease did not appear in this herd subsequent to the time the animals were removed. These two facts practically exclude the possibility that any of the experimental animals were infected prior to the time at which they were isolated.

In judging the part played by meat inspection in removing cholera infected carcasses from the market, the federal meat inspection regulations have been selected as a standard, because most of the meat inspected in this country is inspected by federal employees or by others who follow the federal regulations quite closely. Following are the paragraphs that govern antemortem and postmortem inspection in their relation to hog cholera:

Regulation 9, section 2, paragraph 2. "All hogs plainly showing on ante-mortem inspection that they are affected with either hog cholera or swine plague shall be marked 'U. S. condemned' and disposed of in accordance with section 8 of this regulation."

Regulation 9, section 2, paragraph 3. "If a hog has a temperature of 106°F. or higher and is of a lot in which there are symptoms of either hog cholera or swine plague, in case of doubt as to the cause of the high temperature, after being marked for identification, it may be held for a reasonable time under the supervision of an inspector, for further observation and taking of temperature. Any hog so held shall be reinspected on the day it is slaughtered. If upon such reinspection, or, when not held for further observation and taking of temperature, then on the original inspection, the hog has a temperature of 106°F. or higher it shall be condemned and disposed of in accordance with section 8 of this regulation."

Regulation 9, section 2, paragraph 6. "All animals which, on ante-mortem inspection, do not plainly show, but are suspected of being affected with, any disease or condition that, under these regulations, may cause condemnation, in whole or in part, on post-mortem inspection, shall be so marked as to retain their identity as suspects until final post-mortem inspection, when the carcasses shall be marked and disposed of as provided elsewhere in these regulations, or until disposed of in accordance with section 7 of this regulation."

Regulation 9, section 4, paragraph 1. "All hogs, even though not themselves marked as suspects, which are of lots one or more of which have been condemned or marked as suspects under section 2 of this regulation for either hog cholera or swine plague, shall, so far as possible be slaughtered separately and apart from all other animals passed on ante-mortem inspection."

Post-mortem inspection.

Regulation 11, section 4, paragraph 1. "The carcasses of all hogs marked as suspects on ante-mortem inspection shall be given careful post-mortem inspection, and if it appears that they are affected with either acute hog cholera or swine plague, they shall be condemned."

Regulation 11, section 4, paragraph 2. "Carcasses of hogs which show acute and characteristic lesions of either hog cholera or swine plague in any organ or tissue, other than the kidneys or lymph glands, shall be condemned. Inasmuch as lesions resembling lesions of hog cholera or swine plague occur in the kidneys and lymph glands of hogs not affected with hog cholera or swine plague, carcasses of hogs in the kidneys or lymph glands of which appear any lesions resembling lesions of hog cholera or swine plague shall be carefully further inspected for corroborative lesions. On such further inspection—

"(a) If the carcass shows such lesions in the kidneys, or in the lymph glands or both, accompanied by characteristic lesions in some other organ or tissue, then all lesions shall be regarded as those of hog cholera or swine plague, and the carcass shall be condemned.

"(b) If the carcass shows in any organ or tissue, other than the kidneys or lymph glands, lesions of either hog cholera or swine plague which are slight and limited in extent, it shall be passed for sterilization in accordance with regulation 15.

"(c) If the carcass shows no indication of either hog cholera or swine plague in any organ or tissue other than the kidneys or lymph glands, it shall be passed for food, unless some other provision of these regulations requires a different disposal."

Most of the virus used in the experiments was the same as was used in our routine work of serum production. It was of an exceedingly virulent strain obtained originally from Dr. W. B. Niles of Ames, Iowa. Pigs inoculated with 2 c.c. of this virus were usually ready to kill for virulent blood in seven days. In the remainder of the experiments the virus used was obtained from Dr. A. D. Fitzgerald, Columbus, Ohio. This also was of a highly virulent strain.

The method of securing carcasses that would pass inspection was to inject small shoats with 2 c.c. each of virulent blood and record temperatures every twenty-four hours subsequent to injections. When a decided elevation was recorded the pig was killed and autopsied; then the ham was removed and scalded and a specimen secured for feeding. In each case the virus was injected into the right ham and the specimen fed was secured from the left ham. Complete data concerning these animals appears in table No. 1. Relative to the interpretation of results it should be stated that, except as noted, all the lesions produced were of the acute form of hog cholera, and all the animals that sickened displayed symptoms similar to those produced by that disease. The term "typical lesions of cholera" as used in all the tables indicates that the animals in reference revealed on autopsy petechiae in the kidneys, and in addition characteristic hemorrhages (petechiae and ecchymoses) in one or more other organs.

The animals that became infected were killed when severe symptoms developed in order that their blood might be used to hyper-immunize hogs in the routine of serum preparation.

TABLE No. 1.

Showing temperatures, symptoms, and lesions[1] of pigs from which the specimens fed were taken. (Tables 2, Section b; 3, section b; 4, section b.)

No. of Pig	Date injected	Date killed	Temperature when killed	Symptoms noted	Lesions found	No. of expt in which specimen was fed
106	Jan. 20	Jan. 23	106.2°[2]	None	None	Expt. No. 6 Table 2, Sec. b.
107	Feb. 20	Feb. 23	105.4°	None	Mucosa of bladder**	Expt. No. 7 Table 2, Sec. b.
108	Mar. 30	Apr. 2	105.6°	None	Right inguinal lymph gland** Right sublumbar lymph gland** Left sublumbar and cardiac lymph glands*	Expt. No. 8 Table 2, Sec. b.
109	Feb. 2	Feb. 6	105.6°	None	None	Expt. No. 9 Table 2, Sec. b.
110	April 15	Apr. 18	Below 106.0°	None	None	Expt. No. 10 Table 2, Sec. b.
111	Oct. 21	Oct. 25	105.7°	None	None	Expt. No. 11 Table 2, Sec. b.
112	Jan. 26	Jan. 30	105.2°	None	None	Expt. No. 12 Table 2, Sec. b.
113	Jan. 26	Jan. 31	104.3°	None	None	Expt. No. 13 Table 2, Sec. b.
126	Jan. 22	Jan. 26	104.6°	None	None	Expt. No. 26 Table 3, Sec. b.
127	Jan. 22	Jan. 26	105.2°	Slight dullness	Three or four mesenteric lymph glands	Expt. No. 27 Table 3, Sec. b.
152	Nov. 20	Nov. 24	105.1°	None	Gastro-Hepatic lymph glands*	Expt. No. 53 Table 3, Sec. b.
153	Nov. 20	Nov. 25	105.0°	None	None	Expt. No. 54 Table 3, Sec. b.

1. *—congestion. **—slight hemorrhage. ***—marked hemorrhage.
2. Would not have passed inspection had its temperature been taken ante-mortem.

1. *—congestion. **—slight hemorrhage. ***—marked hemorrhage.
2. Would not have passed inspection had its temperature been taken ante-mortem.

TABLE No. 2.

Showing results of feeding fresh pork to susceptible pigs.

Section a. Pork from carcasses that would not pass inspection.

No. of Expt.	Source of infected material	Quantity fed	Pig No.	Date of Feeding	Symptoms Appeared	Date of Death	Remarks
1	Rind and fat from shoulder	4 lbs.	1–2	July 26-30	No symptoms	———	Pigs later proved susceptible.
2	Flesh and bone	3 lbs.	3–4	Oct. 9	Oct. 15	Oct. 20	Pigs killed when very weak. Typical lesions of cholera in both.
3	Flesh and bone	3 lbs.	5–6	Oct. 20	Oct. 28	Nov. 3	Pigs killed when very weak. Typical lesions of cholera in both.
4	Flesh and bone	2 oz.	7–8	Oct. 28	Nov. 8	Nov. 13	Pigs killed when very weak. Typical lesions of cholera in both.
5	Flesh and bone	1 oz.	9–10	Jan. 7	Jan. 12	Jan. 15	Pigs killed when very weak. Typical lesions of cholera in both.

Section b. Pork from carcasses that would pass inspection.

6	Flesh & bone from pig 106 (table 1)	2 oz.	11–12	Feb. 23	Feb. 28	No. 11 Mar. 4	No. 11 showed typical lesions of cholera. No. 12 developed chronic cholera and recovered.
7	Flesh & bone from pig 107 (table 1)	1½ oz.	13–14	Jan. 24	Jan. 29	Jan. 31	Both pigs killed when very weak. Typical cholera lesions in both.
8	Flesh & bone from pig 108 (table 1)	2 oz.	15	Apr. 6	Apr. 11	Apr. 14	Pigs killed when very weak. Typical lesions of cholera in both.
9	Flesh & bone from pig 109 (table 1)	1 oz.	15	Feb. 8	Feb. 13	Feb. 15	Pigs killed when very weak. Typical lesions of cholera in both.
10	Flesh & bone from pig 110 (table 1)	2 oz.	17	Apr. 18	Apr. 22	Apr. 26	Pigs killed when very weak. Typical lesions of cholera in both.
11	Flesh & bone from pig 111 (table 1)	½ oz.	18	Oct. 27	Nov. 2	Nov. 4	Pigs killed when very weak. Typical lesions of cholera in both.
12	Flesh & bone from pig 112 (table 1)	½ oz.	19	Feb. 1	Feb. 7	Feb. 12	Pigs killed when very weak. Typical lesions of cholera in both.
13	Flesh & bone from pig 113 (table 1)	½ oz.	20	Feb. 1	Feb. 7	Feb. 12	Pigs killed when very weak. Typical lesions of cholera in both.

Remarks on table No. 2, Section a. Experiment No. 1 was conducted in very hot weather. The material fed consisted of rind and subjacent fat. Portions were fed during a period of six days, and, especially in the later feedings, a decidedly rancid odor was present. It is possible that decomposition had something to do with the failure of such large quantities to produce infection. The principal point to be noted is that most of the specimens fed produced hog cholera infection.

Remarks on table No. 2, Section b. The experiments recorded in this table were conducted to determine with what regularity fresh specimens from hogs killed while in the early stages of hog cholera, and the carcasses of which would pass inspection, would produce hog cholera when fed to susceptible pigs. Of the eight specimens fed, all produced the disease.

Remarks on table No. 3, Section a. In this table, the meat referred to as frozen was hung in a rather open garret in an unheated building from the time the animals were killed until samples of their flesh were fed. The weather was such that the hams were frozen most of the time but in some cases there were perhaps a few days during which they thawed to some extent. The meat referred to as chilled was placed in an ordinary refrigerator during the time mentioned.

It is very probable that experiment No. 17 would have proved negative had it been possible to obtain a subsequent check on the susceptibility of the pig fed. Litter mates of this animal were susceptible. Under the circumstances though the experiment was classed among those showing undetermined results.

Experiments number twenty and twenty-two show interesting results. In Experiment No. 20 no visible symptoms appeared and no temperatures were taken. The pig subsequently proved to be immune in spite of the fact that it was a litter mate of seven others all of which were highly susceptible. Thus there is very little doubt that the animal was immunized by the material fed to it. Whether the immunizing effect was due to attenuation of the virus or to the small quantity of virus in the specimen is, of course, unknown. In Experiment No. 22 the pig fed showed moderate symptoms but recovered. At one time a temperature of 106°F. was recorded. There is little doubt that it also was immunized in the same manner. Further, it is highly probable that had it been one of a herd of susceptible pigs others would have been infected by associating with it.

TABLE No. 3.

(Showing results of feeding refrigerated pork)

Section a. Pork from carcasses that would not have passed inspection.

No. of Expt.	Source of infected material	Quantity fed	Pig No.	Date of feeding	Symptoms appeared	Death occurred	Remarks
14	Head of femur and flesh. Frozen 20 days	2 oz.	21–22	Feb. 4	No. 21 Feb. 9	No. 21, Feb. 12 No. 22, Feb. 28	No. 21 killed when very weak. No. 22 probably infected from 21. Both showed cholera lesions.
15	Head of femur of ham. frozen 93 days	2 oz.	23	Apr. 6	Apr. 11	Apr. 14	Killed when very weak. Typical cholera lesions.
16	Head of femur and flesh from ham frozen 62 days. No. 395.	2 oz.	24	Mar. 25	Mar. 31	Apr. 5	Typical cholera lesions.
17	Flesh and bone from virus of pig. No. 396. Frozen 62 days.	2 oz.	25	Mar. 25	No symptoms		Pig found April 5 with prolapsed rectum and was killed. Susceptibility not checked.
18	Flesh and bone from virus pig No. 397. Frozen 62 days.	2 oz	26	Mar. 25	No symptoms	No death	Pig later proved susceptible.
19	Flesh and bone from virus pig No. 398. Frozen 62 days.	2 oz.	27	Mar. 25	Apr. 2	Apr. 5	Lesions of cholera.
20	Flesh and bone from virus pig No. 399.	2 oz.	28	Mar. 25	No symptoms		Pig given 3 c.c. of virus but proved to be immune.
21	Flesh and bone from ham No. 423. Chilled 8 days.	½ oz.	29	May 6	May 11	May 15	No lesions of cholera. Blood proved infectious.
22	Flesh and bone from irus pig No. 424. Chilled 8 days.	*	30	May 6	May 12	Did not die	Pig developed symptoms but recovered. Later proved immune.

TABLE No. 3—(Continued)

No. of Expt.	Source of infected material	Quantity fed	Pig No.	Date of feeding	Symptoms appeared	Death occurred	Remarks
23	Flesh and bone from virus pig No. 425. Chilled 17 days	½ oz.	31	June 11	June 15	June 18	Pig killed when very weak. Lesions of cholera.
24	Flesh and bone from virus pig No. 430. Chilled 12 days.	½ oz.	32	Aug 3	Aug. 9	Aug. 11	Pig killed when very weak. Typical cholera lesions.
25	Flesh and bone from virus pig No. 431. Chilled 12 days.	½ oz.	33	Aug 3	Aug. 8	Aug. 11	Pig killed when very weak. Typical lesions of cholera.
	Section b. Pork from carcasses that would have passed inspection.						
26	Flesh and bone from pig No. 126 (table 1). Frozen 58 days.	2 oz.	34	Mar. 25	Mar. 31	Apr. 7	Lesions of cholera.
27	Flesh and bone from pig No. 27. (table 1). Frozen 58 days.	1 oz.	35	Mar. 25	Apr. 2	Apr. 7	Lesions of cholera.

*Specimen not weighed. Small button of bone equal in diameter toa nickel but three times as thick.

In Experiment No. 21 the pig fed developed severe symptoms and was killed in order that its blood might be used for virus. A careful autopsy revealed no lesions whatever so 2 c.c. of its blood were injected into a second pig. This pig developed symptoms of hog cholera and showed on autopsy extensive hog cholera lesions so the experiment was classed among those producing positive results. The original pig fed was simply one of those cases, by no means uncommon, in which the disease actually exists but in which its presence cannot be verified by autopsy.

Remarks on table 4. The cured hams from which the specimens were taken were prepared by a process known as sugar curing. They remained in the brine approximately five weeks, and after being removed were smoked from seven to ten days in green hickory smoke. The brine was prepared according to the following formula:

Common Salt	8 pounds
Brown sugar	2 pounds
Saltpetre	2 ounces
Baking soda	½ ounce
Water	4 gallons

Dissolve all the ingredients in the water. Boil slowly for an hour and skim. Allow to cool before using.

This has been selected as a representative formula for sugar curing. There are, of course, many formulae in use for this purpose but it is not likely that there is much difference in them as far as their effects on hog cholera virus is concerned. The only substances the use of which the federal regulations permit in preserving meats are salt, sugar, various vinegars, pure spices, saltpeter and sodium nitrate. Benzoate of soda may also be used but its presence must be declared on the label, and it cannot in accordance with the pure food law exist in finished food products in excess of 3-10%.

In sugar curing, vinegars are not used and benzoate of soda is used little if at all. Thus the only substances that might be used which do not appear in the above formula are sodium nitrate and pure spices. The former ingredient may be used to some extent in sugar curing processes, and of the spices, black pepper is quite frequently used. It is not likely though that sodium nitrate exerts more detrimental effects on virus than the corresponding potassium salt, and in the quantities in which they are used in

TABLE NO. 4.

Showing results of feeding cured pork.

Section a. Pork from carcasses that would not have passed inspection.

No. of Expt.	Source of infected material	Quantity given	Pig fed	Date of feeding	Symptoms appeared	Death occurred	Remarks
28	Subcutem injections of washings from bone. Ham 307.	6 c.c. each	36–37	Feb. 28	Mar 7	No. 36, Mar. 13 No. 27, Mar. 23	Both showed typical cholera lesions.
29	Rind from ham 307	4 oz.	38	Feb. 28	No symptoms	No death	Pigs later proved susceptible.
30	Head of femur and flesh from ham 307	2 oz.	39a–39b	Feb. 28	Mar. 4		39a showed lesions resembling cholera. 39b showed lesions of cholera.
31	Subcutem injections of bone marrow washings from ham 308.	10 c.c.	40	May 18	May 24	39a, Mar. 6 39b, Mar. 10	Animal killed when weak. Typical cholera lesions.
32	Material from ham 308.	2 oz.	40	May 18	May 23	Mar. 28	Animal killed when weak. Typical cholera lesions.
33	Meat and bone from ham 323.			July 15	July 18	No death	Cholera discovered in herd from which pig was taken. Experiment valueless.
34	Rind from ham 323	½ lb.	44	July 15	July 20	No death	Cholera of a subacute type discovered in herd from which pig was taken.
35	Injections from bone marrow washings. Ham 323.	20 c.c.	46–47	July 15	———	———	No symptoms appeared. Animal later proved immune. Cholera discovered in herd from which pig was taken.
36	Injection of bone marrow washings. Ham 324b.	10 c.c.	48–49	Sept. 30	No symptoms	No symptoms	Pigs later proved susceptible.
37	Rind from ham 324	½ lb.	50–51	Sept. 30	No symptoms	No symptoms	Pigs later proved susceptible.
38	Injection from bone marrow washings 323b.	5 c.c.	52–53	Oct. 6	No symptoms	No symptoms	Pigs later proved susceptible.
39	Material from ham 323b.	4 oz	54–55	Oct. 6	No symptoms	No symptoms	Pigs later proved susceptible.

TABLE NO. 4—(CONTINUED).

No. of Expt.	Source of infected material	Quantity given	Pig fed	Date of feedng	Symptoms Appeared	Death occurred	Remarks
40	Rind from ham 323b.	½ lb.	56–57	Oct. 6	No symptoms	No symptoms	Pigs later proved susceptible.
41	Meat and bone from ham 378.	2 oz.	58	Feb. 6	Feb. 11	Feb. 15	Pigs killed when weak. Typical cholera lesions.
42	Meat and bone from ham 378b.	2 oz.	59	Feb. 24	Mar. 1	Mar. 5	Pig killed when very weak. Typical cholera lesions.
43	Meat and bone from ham 379.	2 oz.	60	Feb. 24	Mar. 5	Mar. 5	Pig killed when very weak. Typical cholera lesions.
44	Meat and bone from ham 379b.	2 oz.	61	Feb. 24	Mar. 1	Mar. 5	Pig killed when very weak. Typical cholera lesions.
45	Meat and bone from virus pig 413.	½ oz.	62–63	July 27	———	———	Pigs later proved susceptible.
46	Meat and bone from virus pig 414.	½ oz.	64–65	June 27	———	———	Pigs later proved susceptible.
47	Meat and bone from virus pig 415.	½ oz.	66–67	Juno 27	———	———	Pigs later proved susceptible.
48	Meat and bone from virus pig 440.	1 oz.	68	Oct. 18	———	———	Pigs later proved susceptible.
49	Meat and bone from virus pig 441.	1 oz	69	Oct. 18	———	———	Pigs later proved susceptible.
50	Meat and bone from virus pig 442.	1 oz.	71	Oct. 18	———	———	Pig later proved susceptible.
51	Meat and bone from virus pig 515.	1 oz.	71	Mar. 16	Mar. 22	Mar. 28	Typical cholera lesions.
			Section b.				
52	Material from pig No. 152, Table No. 1.	½ oz	72	Feb. 16	———	———	Pigs later proved susceptible.
53	Material from pig No. 153, Table No. 1.	½ oz.	73	Feb. 16	Feb. 23	Feb. 28	Pig killed when very weak. Typical cholera lesions.

sugar curing it is doubtful if any of the spices operate to kill hog cholera virus.

The outstanding fact brought out in table number four is that the virus of hog cholera in pork is frequently but not always killed during the process of sugar curing. Just what makes the difference between those cases in which it is killed and those in which it is not killed? The three controllable factors involved in the destruction of viruses by chemicals are the kind of chemical used, its dilution, and the time during which it acts. Can any of these influences be so modified that they will destroy the virus in all cases? This is a question that still remains to be answered.

As circumstances now appear there seem to be no chemicals that could well be substituted for salt and sugar as preservatives. The strength of the brine might be increased but there is a limit to an increase that would still leave the meat palatable. Increasing the time during which pork is in cure or increasing the time during which it is in the store house after being cured may offer possibilities. The fact that the virus was killed in so many of the specimens might seem to indicate that the time limit during which it can survive the sugar curing process was being approached. As a matter of fact, however, there seems to be no definite relation between the time which the hams were in the store room and the certainty with which specimens from them would prove infectious. All the hams were in cure approximately six weeks. The time during which different ones were in the store room varied from two to eighty-four days. Specimens from the hams representing these two extremes did not prove infectious. On the other hand specimens from two hams in the store room fifty-seven and eighty days respectively were found to contain living hog cholera virus. It thus appears that if time is to be employed as a factor in destroying hog cholera virus in sugar cured pork, store room cost and interest on money invested must be considerations.

It will be observed that although rind was fed in large quantities in individual cases, no infection was caused by it. It was fed in only three experiments though, and so few negative results cannot have much significance. In one instance, ham No. 307, feeding the rind did not produce infection and flesh and bone and also bone marrow washings from the same ham produced hog cholera. In this one instance the virus was evidently killed in the rind when it survived in the deeper parts. Since rind is very

likely to find its way into garbage it is a matter of interest and importance to determine how frequently it carries hog cholera virus, and it is to be regretted that during the time these experiments were in progress scarcity of susceptible pigs prevented determinations of this kind. They are not, though, essential. The real problem is not to determine whether there are parts of a ham that do not contain hog cholera virus; it is rather to determine whether there are parts that do contain it. Bone and bits of clinging flesh are frequently placed in garbage and danger is always present in case they contain virus. It is simply present in a greater degree in case it is found that rind also produces infection.

Besides hams, the parts most frequently sugar cured are shoulders and bacon. There are no good reasons to doubt that shoulders carry hog cholera virus in about the same proportion of cases that hams carry it. It seems quite probable that cured bacon, because of its thinness and because of the relative lack of vascularity of its parts, is less likely to contain virus than are hams and shoulders. This is a point that must be determined with certainty before carcasses showing slight lesions only can be disposed of in the most economical manner.

Viewing the entire situation from the standpoint of biology a very interesting group of co-related facts is encountered. If the filterable virus were possessed of human intelligence it could scarcely devise a more insidious and ingenious method of self preservation. It is known to multiply only in the bodies of swine and conditions favorable for its growth are therefore much restricted. Nevertheless, the difficulties met are overcome in a remarkable manner. The virus exists in the blood stream of the animals it infects and is thus distributed to all parts of the body; it cannot at any time be detected with the microscope; it is present in carcasses before gross examinations will detect it; it does not infect human beings and thus escapes radical measures that would otherwise be taken for its destruction; its presence in herds often drives them to market; it secretes itself in pork where putrefaction, its most deadly natural enemy, is prevented or delayed by curing and low temperatures; then as a final link in a remarkable chain, the virus, in placing itself where possibilities for its distribution are practically limitless is at the same time placing itself in material which as a common practice is fed to hogs.

TABLE NO. 5.

Summary.

Kind of pork	Total No. of Expts.	Number positive	Number negative	Number undetermined	Per cent* negative	Per cent positive	Remarks
Fresh carcasses that would have been condemned.	5	4	1	——	80	20	
Fresh carcasses that would have passed inspection.	8	8	——	——	100	——	
Refrigerated carcasses that would have been condemned.	12	8	1	3	88.8	11.2	
Refrigerated carcasses that would have passed inspection.	2	2	——	——	100	——	Small No. of experiments. Percentage not significant.
Cured carcasses that would have been condemned.	24	9	12	3	43	57	
Cured carcasses that would have passed inspection.	2	1	1	——	50	50	Small No. of experiments. Percentage not significant.

*In figuring percentages undetermined results are not considered.

In general, the results shown in table No. 2, Section b, should constantly be thought of in connection with those obtained in tables No. 3, Section a, and 4, Section a. The experiments recorded in table No. 2, Section b, were conducted to determine whether hog cholera virus in sufficient quantities to infect swine is contained in hams taken from hogs killed while in the early stages of the disease. The experiments recorded in tables No. 3, (Section a) and 4, (Section a) were conducted to determine the effects of refrigeration and sugar curing on the life of hog cholera virus contained in hams. It seemed desirable in conducting the latter experiments to use hams from pigs known to be infected; otherwise it would not have been known whether negative results were due to absence of virus in the hams before they were treated, or to the fact that the virus was killed during the processes of refrigeration and sugar curing.

The experiments established two important facts; first, hog cholera virus in sufficient quantities to infect swine is quite constantly contained in fresh hams taken from hogs killed before symptoms, (other than rise in temperature) appear, and before lesions form; second, when specimens were taken from pigs showing lesions, 43% of the cured ones and 88% of the refrigerated ones proved infectious.

Providing all originally contain virus in quantities sufficient to kill, there can, as far as we can see, be no conceivable difference between hams taken from pigs showing lesions and those taken from pigs that do not show lesions, as far as the effects of curing and refrigeration on the virus contained in them is concerned. However, in order to remove doubt concerning this point, experiments were conducted with two cured hams (table No. 4, Section b) and two refrigerated hams (table No. 3, Section b) taken from pigs showing no symptoms other than elevation of temperature and no lesions. One of the cured specimens and both of the refrigerated ones produced infection. It therefore seems likely that had the hams referred to in table No. 2, Section b, been subjected to curing or refrigerating processes, the results would have been similar to those obtained from feeding specimens from virus pigs showing lesions.

When the results of the experiments just described are examined in their relation to practices observed in marketing, slaughtering, and inspecting swine, there are several phases of the situation that deserve consideration.

Relative to marketing we are at once brought face to face with the fact that 40% of the pork consumed and 15% of that which is marketed in the country is not inspected. This is killed on farms, by local butchers, and by packing establishments that do not supply an inter-state trade. It is a well known fact that many herds are marketed as soon as hog cholera infection is discovered in them, and in places where there is no inspection practically all hogs that appear well on foot are killed and sold for food. It is needless to add that large numbers of virus carrying carcasses must be included among those that reach our markets from these sources. Circumstances thus point to a need for extension of both local and federal inspection.

Turning now to the pork inspected under federal regulations let us examine the regulations themselves with a view to determining how they operate to eliminate from the market carcasses that contain hog cholera virus. First, though, it should be stated that the federal regulations compare favorably with those in force in other countries. The efficiency and thoroughness with which they fulfill their lawful purpose—the protection of human health and human life—is not questioned, but if they do not at the same time operate to protect the swine industry of the country, this fact and the reasons for it should be known, the situation should be looked squarely in the face, and a remedy for it should be sought.

Under existing conditions a consignment of cholera infected hogs reaches market and is first subjected to ante-mortem inspection. With respect to hog cholera, it may contain five classes of hogs: first, dead hogs; these are condemned and tanked; second, hogs that show undoubted symptoms of cholera; these are also condemned and tanked; third, hogs that show suspicious symptoms and temperatures below 106°F.; these are slaughtered; carcasses that show lesions of hog cholera are condemned or passed for sterilization according to the extent of the lesions; those that show no lesions are passed for food; fourth, apparently normal hogs (and those showing suspicious symptoms) that have temperatures above 106; these are condemned or isolated for further temperature records; in case further temperatures are taken the animals are condemned if their temperatures are still above 106°; otherwise they fall into class three or class five; fifth, apparently normal hogs that show temperatures below 106°F.; these pass ante-mortem inspection and post-mortem as well if they do not show

lesions of hog cholera in organs other than the kidneys or lymph glands.

Briefly stated, the requirements in order that a given hog may pass inspection are that it shall not show undoubted symptoms of hog cholera, it shall not show suspicious symptoms plus any hog cholera lesions, it shall not show a temperature above 106°F., and regardless of ante-mortem findings the carcass shall not on post-mortem show hog cholera lesions in organs *other than the kidneys or lymph glands.* What are the chances for virus carrying carcasses to pass inspection? A consideration of symptoms, temperatures, and lesions in their relation to the time at which the flesh becomes infectious, will throw some light on this point.

Relative to symptoms, it need only be stated that a hog will usually show elevation of temperature from one to three days before any marked symptoms of hog cholera appear. The excitement to which hogs are subjected in shipping probably lengthens this time to some extent, because under such circumstances, a slight dullness and sometimes even graver symptoms cannot even by the closest scrutiny be detected.

The temperature record, especially when the dividing point is placed as high as 106°F., offers a very uncertain standard upon which to separate infected animals from sound ones, but it constitutes a most valuable adjunct to other factors employed for the purpose. In the first place there is a wide variation in the normal temperatures of swine—from 101°F. to 104°F. In the second place weather conditions, excitement due to shipping, and other factors that cannot be controlled alter otherwise normal temperatures very materially. It is very probable that most of these influences when they affect temperatures noticeably, operate to elevate rather than to lower them, and this probably is the reason why the dividing point—106°F.—has been placed so high. It is certain that some hogs may carry temperatures near 106° as a result of excitement or exertion, and it is equally as certain that many others carry temperatures below 106° when they are suffering with hog cholera.

Another important thing to recognize is the *usual* hog cholera curve. It rises quite rapidly as a rule, remains high for a few days, and then takes a decided drop, which, if death does not ensue, is followed by a second elevation. The following, reproduced from Hutyra and Marek is intended to show a typical hog cholera

curve. It appears originally in the centigrade scale, but it has for the sake of convenience been changed to Fahrenheit.

The temperature curves we record in young pigs usually rise above 106° for a short time, and as a rule they do not fall quite as low between the first and second elevations as did the above curve (Jan. 21). In other ways the curves we record correspond quite

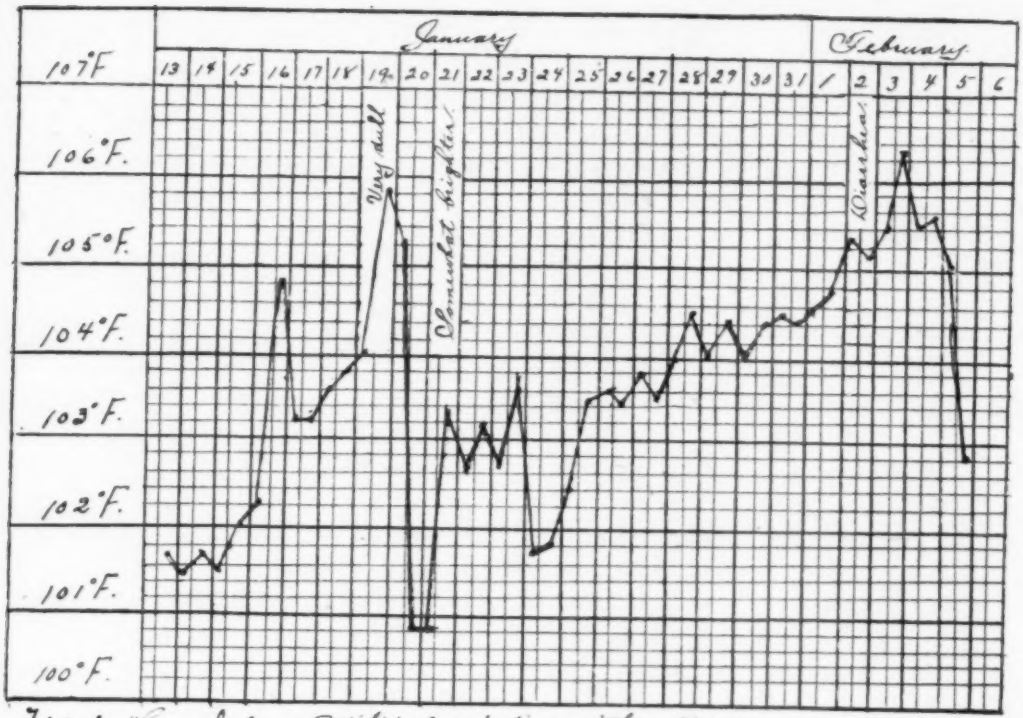


Fig. 1. Hog cholera. Artificial infection with filtered material from a hog affected with cholera. The first rise up to the fourth day of sickness is caused by the primary infection, the second by the secondary infection. (Hutyra and Marek.)

closely to the one shown. In this particular case the animal in question would not, except during the very latest stages of the disease, have been condemned on account of its temperature: symptoms were not recorded until three days after the first decided elevation of temperature occurred; unless the animal was an exception, lesions sufficient to condemn it had not formed during the first day or two on which high temperatures were recorded. Thus there

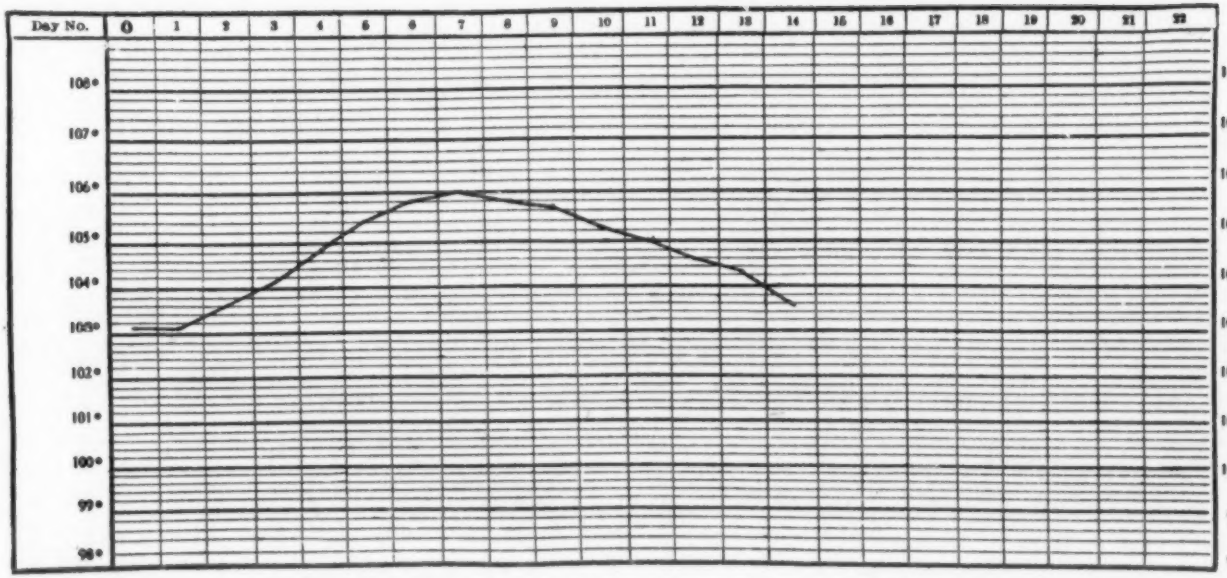
was probably a day or two during which its blood was infectious, when it would have passed inspection.

In order to show more fully something of the number of hogs that will not be rejected on account of high temperatures the following curve, prepared by Craig and Whiting, is reproduced. The animals were infected with intra-muscular injections of small quantities of hog cholera virus. There were 250 of them and the curve shows their average daily temperature during the course of the disease. A second curve, prepared by the same authors, shows the average daily temperature of twenty hogs exposed to cholera by means of natural infection.

It will be understood that on any given day many of the temperatures were above and many were below the point indicated. It should also be remembered that there was a period during the time when the curve was ascending when a large number of normal temperatures were averaged with a few that were above normal. In this respect the curves are slightly misleading but taken as a whole they indicate that during the course of the disease most of the animals showed temperatures below 106° most of the time.

When the lesions are considered as a factor in determining which carcasses shall be condemned it is to be remembered first of all that in some cases, even when hogs are allowed to die of cholera, lesions do not form at all. Carcasses representing this class together with those that do not show lesions in organs other than the kidneys and lymph glands are allowed to pass. Hogs do not as a rule show marked lesions during the first day or two that elevated temperatures are recorded, and often the time between the first rise in temperature and the time when lesions sufficient to condemn are formed, is of much greater duration. Exemption of the kidneys and lymph glands from consideration unless there are lesions in other organs sufficiently well marked to cause carcasses to be sent to the retaining room, undoubtedly results in passing many virus carrying carcasses.

When table No. 2, is examined in its relation to the symptoms, temperature, and lesions necessary to condemn an animal or carcass for hog cholera, we cannot well escape the conclusion that *there is a time in the life of nearly every hog infected with acute hog cholera when it will pass inspection and when bits of pork from its carcass will prove infectious if fed to other swine.* This time varies from a few hours to several days and is measured,



The above curve was drawn from the temperature records of two hundred fifty pigs and shoats receiving one to two cubic centimeters of hog-cholera blood only. All were killed or died between the seventh and fourteenth days

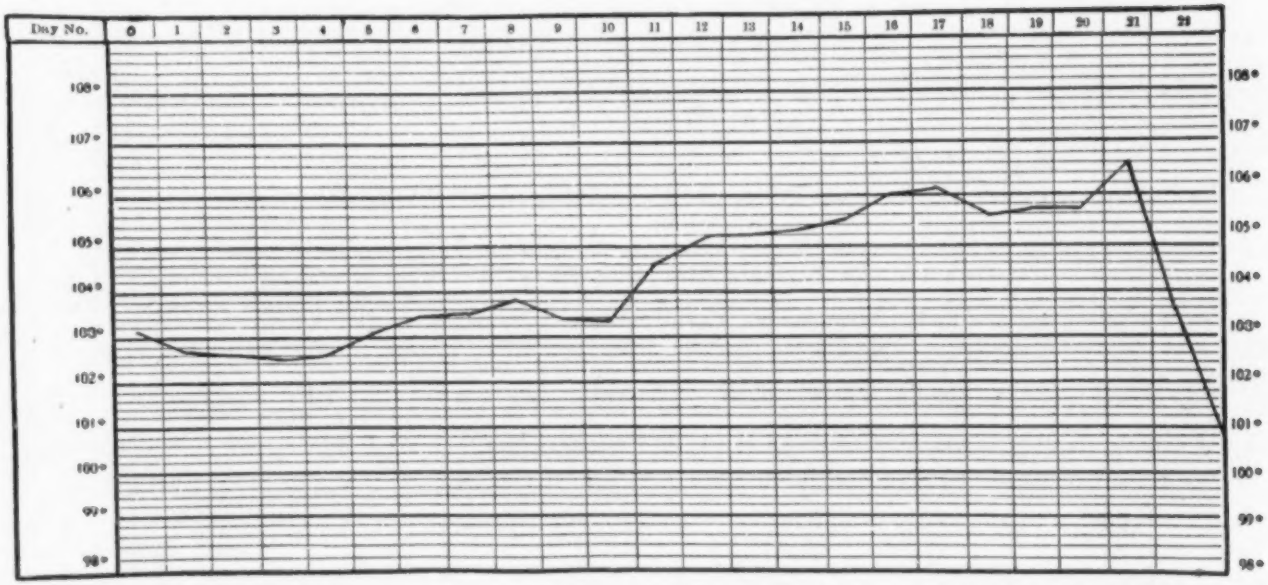


Fig. 4. The above curve shows the average temperature of twenty healthy hogs exposed to hog-cholera in infected pens. All died of the disease

roughly, by the time required for the temperature to rise from normal to 106°, or by the time required for symptoms to develop or extensive lesions to form after the temperature curve starts upward. It is possible that the meat of some hogs is infectious even before the rise in temperature takes place, for it is to be remembered that hog cholera virus *causes* the elevation and it must therefore be present *before* the elevation occurs. Whether, or for how long, it is present in quantities sufficient to infect, and before the elevation of temperature occurs, are questions on which we have insufficient data.

Considering again the infected herd as it is unloaded from the car and comparing it with similar herds in the field in which observations have been made and temperatures have been taken, we cannot help knowing that there are often present in such herds considerable numbers of apparently healthy hogs that show high temperatures due to hog cholera. Some of these are weeded out on account of temperatures above 106°, and a few on account of lesions, but many cannot do otherwise than pass. How many, we do not know, but for purposes of comparison it may be stated that during the decade ending in 1911 a yearly average of 18000 hogs were condemned because of cholera.

Each infected carcass passed possessed almost infinite possibilities in regard to its final distribution. Parts may be worked up into sausage or cooked products and hams, shoulders, and bacon may be cured or shipped in fresh or refrigerated form to supply retail butchers. These facts, coupled with what our experiments have shown relative to the probabilities for the presence of hog cholera virus in market pork, readily lead to the belief that whatever may be the means of spreading hog cholera from herd to herd in different localities, its spread from locality to locality could, if all facts were known, be traced in many cases to shipping and slaughtering hogs in the early stages of cholera and the subsequent sale of pork from the carcasses of these animals.

The results of the experiments described suggest the need of preventive measures for the purpose of diminishing the number of infections due to feeding pork trimmings. These measures naturally fall into three general classes: first, measures to prevent marketing cholera infected hogs; second, measures to turn more carcasses from infected herds into products in which the virus will be killed; third, measures to acquaint swine breeders with the

danger involved in feeding garbage containing pork trimmings, and with the ways to avoid this danger.

Preventing the shipment of cholera infected herds should be the first object sought because it attacks the trouble at its source. There will be widespread infection as long as this is a common practice, and it will be a common practice so long as it is possible to sell infected hogs for the price that sound ones bring. Since the discovery of anti-hog cholera serum the breeder has in it an agent which at any given time will usually protect all of his hogs which are not, at that time, already dangerous carriers of the hog cholera virus. This statement is based on the facts that pork from hogs killed as soon as an elevation of temperature is recorded proves to be quite generally infectious, and that serum will usually protect hogs treated before an elevation of temperature takes place. Thus it is true that the enactment and enforcement of measures to prevent shipping cholera infected herds need not cause undue hardships in any place where hog cholera serum is available.

The economic difficulties involved in condemning or passing for sterilization infected carcasses which, in reality, are entirely fit for human food, are of a nature which render them very difficult to overcome. The scientific difficulties met in seeking to remove all carcasses that contain virus are no less trying. It has been shown that the carcasses of hogs that show no symptoms other than slight elevation of temperature, and no lesions whatever, may contain hog cholera virus sufficient to infect other hogs. Because the normal temperatures of swine vary so widely no mark can be set that will separate out infected animals with any degree of accuracy. A temperature of 104°, for instance, may be normal or three degrees above normal. There is no method known of detecting all virus carrying carcasses, but, as a general principle, we believe that rigid ante-mortem *herd* inspection with a more severe interpretation of temperatures and lesions in hogs that are members of infected herds, together with a tagging system rendering it possible to place losses due to condemnation with the man who ships the hogs, are worthy of consideration. Obviously measures of this kind would serve the double purpose of removing more infected carcasses from sale in the form of raw products, and of preventing the shipment of many infected herds that otherwise reach our markets.

Under existing conditions the most promising outlook for

dealing with this phase of hog cholera control consists in acquainting swine breeders with the dangers incident to feeding their own kitchen refuse, in case there are trimmings from market pork contained in it. The ordinary farmer has recourse to four very effective methods of protecting his herd from dangers incident to garbage feeding; he may keep pork trimmings out of the garbage, he may discontinue the practice of feeding garbage, he may cook all garbage before it is fed, or he may immunize his hogs. Men who collect and feed kitchen refuse from cities have recourse only to the two last named methods of protection.

It is sometimes suggested that statutory restrictions should be placed on feeding collected garbage to hogs. The objections to this practice are that it is in a degree repulsive, and that the heavy losses caused by it more than offset the gain it produces. The first objection is well sustained in many individual cases and in others it is not. The French have a saying, "Not what, but how", and this applies well to the point in question. If the material is fed fairly fresh and if the hogs to which it is fed are provided with clean quarters there are no very well sustained objections to the practice, for the material fed is in the last analysis only the refuse from what we ourselves eat. Many thousand hogs are fattened on garbage each year and statutory restrictions placed on the practice as a whole would not, especially since the discovery of anti-hog cholera serum, be justified.

Cooking kitchen refuse to destroy hog cholera virus contained in it is very effective in individual cases, and it possesses the additional advantage of rendering much of the material in it,—for instance potato parings,—more palatable and more nutritious. It could not, though, be well enforced as a sanitary measure; it is quite expensive in some localities, and, in order to be effective it requires more time and care than most men will give to it.

Serum-virus immunization seems to be the most logical means of preventing hog cholera in large herds that are fed collected garbage. It is effective, reasonably cheap, and has the decided advantage of protecting from infection by channels other than the one incident to feeding kitchen refuse.

Summary and Conclusions

1. Meat and bone taken from the carcasses of hogs killed before any manifestations of hog cholera other than elevation of tem-

perature take place, and at a time when they will pass inspection, will usually produce hog cholera when fed in small quantities to susceptible pigs.

2. In places where meat inspection is maintained, it is impossible, even with the severest interpretation of temperatures, symptoms and lesions now practicable, to remove from market all carcasses of hogs that contain hog cholera virus.

3. We believe a more severe interpretation of temperatures and lesions in hogs known to come from infected herds, will remove many more virus containing carcasses than are now removed, and without resulting in the condemnation of appreciable numbers of carcasses that do not contain virus.

4. The economic difficulties in the way of placing more severe interpretations on temperatures and lesions observed in hogs that are members of infected herds are worthy of study. Whether the number of virus carrying carcasses that pass inspection is large or small, the danger of new infections due to passing them is proportionate to the number passed.

5. In hog cholera infected carcasses that pass inspection:

The virus is not often killed in parts sold as fresh or refrigerated products.

The virus is often, but not always, killed in hams that are sugar cured. (In our experiments in twelve cases in twenty-one).

6. Anti-hog cholera serum will, at any given time, usually save all hogs in a herd the carcasses of which will not at that time, already prove infectious if small parts are fed to susceptible pigs.

7. Measures to prevent hog cholera infections due to feeding trimmings from market pork should include efforts to prevent marketing infected herds, efforts to prevent the sale of carcasses in products in which the virus is not killed, and efforts to acquaint swine breeders with the danger incident to feeding kitchen refuse.

8. Farmers can avoid the danger mentioned by discontinuing the feeding of kitchen refuse, by placing all pork trimmings elsewhere than in the garbage pail, by thoroughly cooking all garbage before it is fed, or by immunizing their hogs. Men who collect and feed city garbage can avoid the danger by cooking all the material they feed, or by immunizing their hogs.

ACKNOWLEDGEMENT. The writer is deeply indebted to Dr. V. A. Moore whose keen interest in the work has been a constant source of encouragement, and whose advice has been frequently

sought and utilized during the four years in which the experiments were in progress.

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OSTEOMALACIA OR CAGE PARALYSIS IN PRIMATES*

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"Cage paralysis" or "cripples" is a condition of such frequent occurrence, particularly among the primates, that it forms one of the most serious obstacles to the maintenance of large and complete collections of wild animals in captivity. Undoubtedly osteomalacia of the primates, has long been confused with rachitis, which it very closely simulates, particularly in the slowly progressive cases where extensive deformities have taken place.

The lesions in the bones are very similar in both cases, and even clinically they closely resemble each other. The essential point of difference exists in that in rachitis we are dealing with a congenital state in which the bones were never normally calcified, while in osteomalacia the disease is an acquired one in which the once normally calcified bones become decalcified.

The differentiation, however, is clear and is now fully described in many monographs treating of osteomalacia and rachitis.

OCCURRENCE. The occurrence of this disease is not restricted to animals from any particular geographical area, or to any special season of the year, having come under our observation in each of the four seasons.

SPECIES AFFECTED. The disease among wild animals occurs in sapajous, macaques, marmosets, Diana monkeys, green mon-

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keys, baboons, orangs and chimpanzees in point of frequency in the order named.

Age. The disease may affect either young or old animals. While there seems to be no marked relation between age and occurrence, it more frequently manifests itself in those animals which have been in captivity for some time, rather than in those recently arrived.

Sex. The disease occurs in both sexes. The greater proportion under our observation have been males. This is exactly contrary to the condition in man, where osteomalacia occurs almost exclusively in females, and is most commonly seen bearing a close relationship to the puerperal state. It is therefore interesting that in the species most closely allied to man, it occurs without this relationship, and in animals in which procreation during captivity is exceptional.

Etiology. While confinement has a manifest influence, we are still in the dark concerning the *essential* etiological factors in the causation of this affection.

A deficiency of earthy salts in the food would seem to be a natural explanation. The presence of an infection has been suggested, but if this exists, it must be habitually introduced in the food or water, rather than transmitted from animal to animal. Healthy animals have been associated with those diseased for an indefinite length of time, without apparent injury; and comparison to a similar condition in man, would seem to exclude this possibility. A morbid peculiarity of the constitution, and a special predisposition seems to be requisite for the causation. When this susceptibility to the disease exists, then exposure in ill-ventilated small and dark cages probably acts as an exciting cause.

Confinement in the smaller cages apparently offers some predisposition to the disease, since we have observed more cases developing in the smaller and darker side compartments than in the larger, more airy and better lighted ones. It is interesting to note in this connection that there has never been a single case in the large lemur cage, which is situated in the main corridor of the Primates' House in the New York Zoological Park, and which receives a great abundance of sunlight during a large part of each day. In this cage the conditions much more nearly approximate the normal habitat of the primates than we are able to afford in other portions of the building.

Age appears to play no definite factor in the production of the disease as we have seen it; though, as stated above, the time in captivity does seem to be an important consideration.

The question of possible primary hemic conditions must not be neglected, particularly as the disease apparently occurs most commonly, under conditions in which we might naturally expect a greater or lesser degree of anemia. We believe that primary anemia is not a frequent introductory condition, though secondary anemias are doubtless frequently present in the early, as well as the later stages of the disease, but apparently not as an essential primary inductive agent.

DURATION. The disease is nearly always progressive, but we have observed numerous cases which were subject to at least temporary cessation, covering a period of several months. It may assume an acute or a chronic form. In the former case three to four months is the average, while mildly progressing forms may extend over a period of several years before a fatal termination.

SYMPTOMS. While there are no positive premonitory symptoms which are characteristic of this malady, still there are certain signs, the appearance of which will justify a provisional diagnosis. One of the first symptoms manifested is that the subject becomes less active than usual, instead of running and leaping about from swing to swing, it sits on the floor or isolates itself in some far corner of its cage and takes very little interest in its surroundings except at feeding time; for the appetite generally remains good up to the later or terminal stage of the disease.

Gradually a noticeable stiffness is apparent when the animal moves about. This stiffness is most marked in the posterior extremities and generally progresses quite rapidly. During this stage, the animal is apparently free from pain, but of this one cannot feel sure, since we have observed that, as a rule, monkeys can stand considerable pain without any external manifestation of suffering. Later the movements of the animal become quite cumbersome, its actions resembling those of animals suffering from rheumatism. If the animal is closely examined, even at this early stage of the disease, it will be found that there are marked changes going on, especially in the bones.

Considerable alteration in the form of the thorax will be found. The resistance of the bones is greatly diminished, and they break under a slight strain, so that fractures (particularly green stick

fractures) and distortions are apt to be met with. Marked osseous changes may take place, apparently without constitutional symptoms. However, the patient soon loses its spirit and the general health fails.

The skin is dry and the hair lusterless. There is beginning emaciation, the muscles becoming soft and flabby. The animal is generally subject to frequent attacks of indigestion, accompanied by swelling and abdominal pain. No urinary manifestations are present in this stage of the disease.

Partial paralysis of the posterior extremities soon comes on, with atrophy of the muscles of the loin and limbs. The progress of the disease is now generally quite rapid, and the animal lies huddled up in a corner of its cage; if forced to move, rises languidly and with difficulty, and moves the limbs rigidly, as if they were without joints. Its locomotion is extremely cumbersome, generally using its long arms as a cripple would use crutches.

With constant decubitus the patient fails, rapidly becoming emaciated and weak. Abscesses and sloughs are common over the bony prominences of the pelvis and at the base of the tail. These ulcerations have a tendency to spread, forming irregular and sometimes deep sloughing excavations, with no tendency to heal. No pain is evident by manipulation of the partially paralyzed extremities. The *musculo-tendinous* reflexes are decreased or obliterated.

The paralysis of the posterior limbs increases, and the animal, becoming completely paraplegic, loses sphincteric control, with incontinence of urine and feces. Tactical and pain anesthesia develop in the involved areas so that a pin may be thrust into the feet or legs without the animal apparently noticing it.

Various distortions of the bony frame-work develop, even in the early stages, and these changes are most frequently noted in the spinal column and thorax, as well as in the long bones of the extremities, depending largely upon the superincumbent weight and muscular contraction. A deformity simulating the classical "pigeon breast" is shown. Respiratory embarrassment frequently results from these deformities. General anemia and bronchitis are nearly always associated with advanced cases.

While we have tried to picture typical cases of "cage paralysis," it is important to note that there is a wide margin of difference in respect to the degrees of severity which may characterize different cases, and the diagnosis is by no means easy, even to careful observers, in the early stages of the disease.

PROGNOSIS. This condition can never be accounted less than serious. While a case in its very earliest stage is much more hopeful than one that is far advanced, with bones extensively softened, yet the prognosis as to recovery is always bad. In the earlier and more favorable cases, the disease may apparently be arrested.

From the foregoing pathological lesions it is hardly to be expected that healing and regeneration of the extensively altered bones, or of the degenerated nerve tissue, can take place.

TREATMENT. In respect to the treatment to be recommended and instituted, we are of the belief that this can only be employed, with any rational hope of benefit, during the period of incubation, and with the anticipatory purpose of prevention. It is but seldom, however, that the necessary advantage of this early knowledge of the disease is secured, and when the true nature of the trouble has become apparent it is often too late to resort to the remedial measures which might have been employed in the early stages. We are using freely bone-dust and limewater in the food and water of our cases. Daily administration of pure olive oil with the food has a decided nutrient effect on these cases. Also the daily administration of the dried extract of thymus, thyroid and adrenal glands we believe to be of considerable value in treating this condition in the early stages of the disease. These substances being practically odorless and tasteless, are readily partaken of by the animals. When the morbid process of the disease was active, these remedies have been useless. While these substances may not act as a specific remedy, they certainly have a distinctively tonic effect in the cases in which we have used them.

Everything possible should be done to improve the general health; sunlight, dry and well-ventilated quarters are absolutely essential. A varied, as well as a nutritious diet, is very important. Care should be taken to select food containing a relatively proper adjustment of both organic and inorganic food elements.

The disease as it appears in primates is chiefly characterized by decalcification of the bones, but degenerative lesions of the central nervous organs are, though probably secondary, an essential manifestation of the disease.

PATHOLOGICAL ANATOMY. *General Nutrition.*—As a rule, the general nourishment of the body does not appear to suffer in the early or middle stages of the disease. The adipose is abundant, of normal color and consistence, as the animal eats well. As the dis-

ease progresses, a gradual shrinkage of the paralyzed extremities takes place (to be discussed under the appropriate headings); but the body, as a whole, does not suffer until secondary complications, such as bronchitis, hypostatic pneumonia and similar terminal conditions arise.

For these reasons it happens that the animals often remain satisfactory subjects for exhibition until the deformities or paralyses become sufficiently marked to attract the attention of the ordinary observer. In some cases, where the appetite remains good, probably as the result of the lack of normal exercise, the animal, particularly the baboons, may become too fat. Emaciation is, however, eventually an accompaniment of the terminal stages of the disease in all except the very acute and actively progressive cases.

Skin and Mucous Membranes. The color of the skin and mucous membranes depends largely on the condition of the blood. In the middle and later stages the hair becomes rough and brittle, or it may fall out in places. The surface of the skin is covered with thickened epithelial scales. Trophic ulcers at points of pressure, as over the tuberosities of the ischium, are common in the terminal state. They are indolent, gangrenous and show little tendency to heal. The mucosa of the tongue becomes covered with a thick coating and sores develop on the gums. As a rule these changes appear only in the later part of the disease and in the earlier stages no changes in these membranes are to be found. As a rule, the subdermal fat of the paralyzed extremities finally become atrophic.

Blood. On account of the lack of a well-established normal standard in each of the various species, blood counts and hemoglobin tests are unsatisfactory and we must rely, for judgment as to the hemic state, entirely on the general appearance of the blood and on the tissues in which it circulates, also on the morphological variations in the character of the cells. With these points as the basis of our comparison we believe that, as a rule, little or no change in the morphology of the blood takes place, except in the later stages of the disease, where many complicating conditions arise. The gross appearances of the blood, in terminal cases, exhibit the usual characteristics of extreme anemia and coagulation is oftentimes very much retarded.

MUSCLES. No definite alteration, which can be looked upon as other than entirely secondary, has been found in the muscles. There are no changes in those of the paralyzed extremities, except a general wasting with fat absorption, though occasionally there is a relative over-deposition of adipose. The muscle cells become atrophied, but no nodes of disintegration or of nuclear proliferation have been seen and the atrophy seems to be entirely one of disuse, occasionally accompanied by a pressure-atrophy following over-deposit of fat. The muscles away from the immediately involved extremities show no changes, except such as are entirely dependent on the secondary conditions induced by the disease. No lesions of the smooth muscle distribution have been found.

OSSEOUS SYSTEM. Disease of the bony tissue appears to us to be the essential characteristic of the disorder and it is on these changes that we classify the disease as osteomalacia, identical in all its essential particulars with the condition so fully described as it occurs in man and the domestic animals.

All the bones of the body, even those of the skull, eventually become involved. The changes are most obvious and deformity most prominent in those bones which may be looked upon as the *supporting framework* of the body; these are the bones of the lower extremities, particularly the femurs, the spinal column and those of the thoracic cage. The pelvis is relatively much less deformed than in man, probably because the weight of the body is less suspended on these bones in the monkeys, which ordinarily use the upper extremities for the purposes of locomotion, together with the lower. Very likely it is for this same reason that the thorax shows very early and much more pronounced deformities than is the case in the human.

One of the very earliest osseous deformities, consists in a bowing, usually a posterior kyphosis of the spinal column, most marked in the dorsal region associated with a marked hypertrophy of the lumbar and sacral vertebrae. Lateral deviations are, in our experience, out of the ordinary. This deformity is quite as frequent in the straight-backed monkeys as in those which present a normally curved spinal column. The position, already described, which the animal early begins to assume is doubtless largely reponsible for this very marked deformity.

The thorax presents some of the most typical malformations. The lower ribs generally become more widely separated, while the

upper ones, particularly those to which the pectorals are attached, become bowed in, sometimes forming a peculiar letter S deformity. Ordinarily this causes a throwing forward of the sternum, producing in some cases a typical "pigeon breast". The points of juncture of the ribs with the costal cartilages become enlarged, causing nodes like those typically seen in rachitis (the "rachitic rosary"). Special types of deformity of the thorax may be seen, depending largely on the physical habits of the particular animal and on the character of the spinal column deformity.

The bones of the lower extremity are usually more or less deformed, ununited fractures may be present, surrounded by uncalcified fibrous callus. As a rule, an outward lateral curvature is presented, but on account of the early paralysis and since the animal very soon learns to support itself on the upper extremities, swinging the body between the arms as in using crutches, the relief of weight from the lower extremities doubtless prevents extreme deformity of the bones. In our opinion the bony changes are inaugurated in the bones of the lower extremities, if we may judge from the symptoms first manifested and from the earliest development of deformity. The ends of all the long bones frequently become enlarged.

Changes in the pelvis are not very marked and, as a rule, the form is fairly well preserved, but, consequent upon deviations of the column, various lateral deflections may be seen. The most frequent deformity, while not really one of the pelvis itself, is the development of an unusually acute angle at the juncture with the lumbar and sacral column.

Deformities in the upper extremities are not usually present, except for increase in size of the epiphyseal ends of the bones and, as a rule, these appear rather late in the disease. This is probably due to the fact that involvement of the upper extremities of the animal are among the very later stages of the disease, and ordinarily before the animal has proceeded so far he has either succumbed to the terminal processes or, having become unfit for exhibition, has been killed.

Deformities of the skull have not been noted by us, although the bones are found extensively softened and thickened.

There is no question in our minds but that the degree of deformity is dependent mostly on the amount of weight of pressure to which the individual bones are subjected, since, in the various parts

of the body, all of them are found to show the essential pathological changes in about equal degree, though we believe that they are inaugurated in the lower extremities and spinal column. In the terminal condition any of the bones, even the petrous portion of the temporal bone, may be readily cut with a scalpel without previous decalcification.

As a rule, where secondary injury is not present, the diseased bones present on their external surface very little indication of disease and none of inflammatory reaction. Periostitis occurs, we believe, only from some outside cause and generally the bone is smooth, though the epiphyseal ends appear symmetrically swollen. The animals ordinarily evince little or no pain on pressure of the bone, even to the point of crushing it, for in a large proportion of cases the femurs, for instance, may readily be broken with the fingers. One must remember in this respect, however, that many of these animals do not appear to be very sensitive to pain from any cause.

The gross appearance of the sectioned bone varies greatly. Generally the compact external plates are considerably thinned, the marrow space being considerably increased. As a rule, the outer shell presents a certain amount of lime salts and is still more or less hard, but in some cases, particularly near the epiphyseal ends of the bone, it is found to be soft or semi-elastic, resembling in its physical attributes cartilage more than bone. The periosteum shows no notable change in most cases. In the cases of the large flat bones, the entire thickness is transformed into an even greyish semi-cartilaginous material.

The bone marrow also varies greatly in appearance; in places, usually in the shafts of the long bones, it is bright red in color and presents semi-solid areas resembling nodules of cartilage. In the epiphyseal ends, and sometimes throughout the shaft as well, the medulla is represented by a diffuse soft greyish mucoid material in which fine spicules of semi-cartilaginous bone are found representing the normal compact framework of the marrow and cancellous portions. Where cartilage and bone are closely united, as over the head of the femur or between the vertebrae, the marrow seems to have extended into and replaced the cartilage to a large extent. Occasional cystic cavities are found both in the cancellous portions and in the marrow proper; these spaces are generally filled by a semi-fluid, mucoid or colloid material.

The microscopic alterations vary and apparently without direct relationship in any instance to the special animal or to the circumstance under which the disease developed.

Some of the bones show an almost complete replacement of the normal marrow tissue by compact masses of cells; small round cells, multinuclear giant cells, and large polymorphous cells, the elongated processes of which form a supporting stroma. Blood vessels, most of them newly formed, are found quite abundantly and about them are seen plasma cells. Extravasations of blood, with resulting disintegration and pigment deposition, are seen commonly. The giant cells are very numerous in places and are so distributed throughout the tissue as to closely resemble the structure of giant-celled sarcoma. As a rule, in these instances the endosteum is largely replaced by an incomplete layer of large osteoclasts about which absorption of the compact tissue is obviously taking place. Absorption of lime salts and removal of the organic framework of the bone apparently takes place jointly and at the same time. In many of the cases marked lacunar absorption is also apparent in the compact tissue. In general, no effort toward the formation of new bone or cartilage is to be seen; but occasionally areas are found, notably in the epiphyseal ends, where nodules of a typical cartilage are being formed, but in none is calcification taking place, the processes not even extending on to the formation of osteoid tissue. In some bones, and these we believe to be taken from the more slowly progressive cases or those in which for the time being the disease has been arrested, this abnormal marrow has been replaced by a mucoid tissue, which has occasionally broken down into a fluid, forming the cysts mentioned above. Where marrow destruction is so extreme, as in specimens of this kind, it is difficult to understand how regeneration of the red corpuscles can take place, hence more or less anemia must be expected as a direct sequence of these lesions.

Another type of changes found partly in the same skeleton as the above, and also alone in separate cases, comprises the alterations described as typifying true osteomalacia. In these bones lacunar absorption is not apparent, but instead the marrow is limited off from the compact tissue by a relatively normal endosteum which encloses no osteoclasts but internal to which is found a layer of osteoid tissue, possessing all the organic structure of normal bone, but from which the lime salts have been removed. Except

in this one particular the tissue seems in many ways to be normal. In places, however, the osteoid layer, particularly about the larger Haversian canals, is becoming infiltrated by large polygonal cells, small round cells, and new blood vessels are beginning to form from those originally in the Haversian canal, apparently tending toward the condition noted in the so-called marantic cases.

Vascular System.—Changes in the heart are neither characteristic nor constant. Fatty degeneration of the myocardium is, however, not infrequently found, and in the acute terminal cases parenchymatous alterations may be present.

The arteries also occasionally show fatty degeneration of the intima, as a rule, more pronounced in the larger trunks. Some of the smaller visceral vessels show occasional interstitial increase or arterio-capillary fibrosis; and hyaline degeneration, particularly in the vessels of the brain and cord, is not infrequent.

Digestive Tract.—No changes except a general anemia have been observed and the clinical manifestations indicated normal digestive function except in the later stages of the disease.

Pancreas and Digestive Glands.—No lesions bearing on the disease have been discovered.

Liver.—More or less pronounced fatty degeneration is usually seen, probably largely the result of chronic congestion which is almost invariably present. Not infrequently perivascular interstitial hyperplasia, sometimes with round-celled infiltration and active interstitial hepatitis, is found.

Respiratory Tract.—Bronchitis is ordinarily present in the middle or latter stages of the disease; not infrequently it extends to broncho-pneumonia which is very often the immediate cause of death in these cases. Chronic congestion of the lungs is also very common. These animals appear particularly prone to tubercular infection when the process is either extensive in, or entirely localized to, the lungs and the adjacent lymph nodes, from which a general infection is very likely to arise.

Spleen and Lymph Nodes.—Congestion and sometimes acute hyperemia of these structures is present. As a rule ,they are more or less enlarged, due to acute chronic hyperplastic lymphadenitis.

Ductless Glands.—The thyroid gland shows no lesions, it is apparently neither increased nor diminished in size. The thymus body shows no variations from the normal. The adrenal glands frequently show congestion, with slight fatty degeneration of the cortical cells.

URINARY TRACT.—The kidney ordinarily shows more or less congestion with fatty and parenchymatous degeneration and occasionally slight interstitial nephritis. The bladder exhibits no alterations and we have never found it to contain calcareous deposit, as has been reported in occasional cases in man (Dock, *American Journal of Medical Science,* p. 499, 1895.)

GENITAL GLANDS.—The disease has been found, in our cases, most frequent in males, even those presenting the osseous lesions supposed to be characteristic of "true osteomalacia," and we are therefore unable to state as to the relationship between the ovaries and osteomalacia in the primates, through the bearing of the puerperal state and the development of the disease in man seems to be well established. It is noteworthy that the primates chiefly affected rarely reproduce in captivity or show any marked sexual proclivities. In so far as we have investigated the disease, there seems to be no pathological changes present in the genital glands of either sex.

CENTRAL NERVOUS SYSTEM.—Changes in the central nervous system are constant in the well-developed stages of the disease and the symptoms arising from this involvement of the brain and spinal cord are among the most characteristic of the conditions, tending to overshadow the osseous alterations. Probably for this reason the condition has been commonly looked upon as a primary disease of the central nervous system and it was along these lines that we first undertook the study of the malady. In the light of more recent observation it appears to us that the osseous lesions precede those of the central nervous organs, which are probably secondary, though we must not forget that some observers still look upon the osteomalacia as a tropho-neurosis (Fehling: see Mallard. "Osteomalacie a' forme nerveuse." *Bull. Soc. med. d. hop. de Lyon,* 1903, II). It does not appear at all strange that the disease should have been so long considered as one primarily of the nervous organs, since in the study of these animals it is often impossible to properly inspect or palpate them, and we are more dependent on the study of the movements of the animals. From simple observation alone, one cannot fail to be impressed with the idea that the disease is chiefly a muscular or nervous disorder, and it is only when we are able to closely inspect the animals that the earlier changes in the bones with their deformities can be made out. In reviewing the literature of osteomalacia as it occurs in man, we have

been struck with the meagre account of the nervous lesions which accompany the disease in the human, probably because the prominence of the osseous changes has overshadowed them. Many otherwise careful descriptions of the disease entirely omit this important system.

It is probable that the malnutrition and anemia which accompany the disease are largely responsible for the lesions of central nervous organs, but these alone, to our minds, do not satisfactorily explain all the changes which we have found in the brain and spinal cord. Doubtless the deformity of the spinal column with pressure on the cord, posterior root ganglia and nerve roots, causes certain of the lesions, but in our opinion there is still a more close relationship existing between the disease and these alterations which may be directly and independently produced by the essential etiological factors. We are as yet unable to give a plausible explanation of this relationship. It seems to us most likely the changes develop secondarily or after the bony lesions are comparatively well advanced, since in one instance, one of the earliest cases studied by us no degenerative alterations of the spinal cord were found. Again the great variation in the affected tracts noted in our cases would apparently indicate that the disease was not a primary or specific one of the central nervous system for the lesions are not constant but variable.

The alterations found in the brain consist of chromolytic changes in the ganglion cells, and of a dilatation of the lymph spaces associated with more or less congestion of the cerebral vessels. The degenerative factors seem to have a particular selection for the cells of the motor cortex, if we may judge from the changes found in the spinal cord.

In the cord the most common lesions noted by us have been degenerations of various tracts, most constantly of the direct and crossed pyramidal tracts; also the columns of Gall and Burdach (see reports). Lesions simulating those of poliomyelitis have been seen, and in general changes like those found in the brain. The blood-vessels of the cord, almost without exception, show pronounced alterations, and it is highly probable that these are in a large degree responsible for certain of the degenerated cells and fibers. The posterior root ganglia have been found to show diseased ganglion cells in some of the cases with a consequent degeneration of the posterior nerve roots. The anterior nerve roots have also occasionally presented degenerated fibers.

CASE X. *Macaque* (*Macacus cynomolgus*). This was a mildly progressing case of "cage paralysis," extending over a period of one year. Only at the late stage of the disease were emaciation and atrophy of hind limbs marked features.

POST-MORTEM SUMMARY. *Body*—Shows marked atrophy; curvature of spine. *Heart*—Diastole, normal. *Lungs*—Pigmented; otherwise normal. *Liver*—Congested. *Kidneys*—Congested. *Spleen and Lymph Nodes*—Congested. *Stomach and Intestines*—Anemic. *Genito-Urinary Tract*—Negative. *Osseous System*—All bones show general softening. Thorax laterally compressed. Ribs almost entirely cartilaginous. *Lumbar vertebrae* enlarged, softened, and showing quite extensive anterior curvature.

BLOOD EXAMINATION (specimen taken from the ear, just before animal was killed). Hemoglobin 65 per cent. (Dare). On drawing the blood it was found to be abnormally light in color and to flow very slowly, being of a somewhat gelatinous consistency like the blood in leukemia. It clotted rapidly, but the resulting clot was not so firm and compact as normal.

The red cells are found to vary greatly in size, many microcytes and macrocytes being present. Poikilocytes are numerous, but no degenerated cells were found. A few normoblasts were found and a few megaloblasts. Blood plates are very numerous. Leucocytes are found to be relatively very frequent, a few of them are pigmented, and one very large mononuclear leucocyte was found. The different leucocyte count shows:

Polynuclear neutrophiles	67.0 per cent.
Lymphocytes	27.5 per cent.
Mononuclears	0.5 per cent.
Transitionals	3.0 per cent.
Eosinophiles	1.0 per cent.
Basophiles	1.0 per cent.

The granules in the eosinophilic cells are notably smaller than in man, otherwise the cells do not appear to differ much from those found in the human.

BONE MARROW (*Smear*). Many abnormal cells are present. Giant cells, for the greater part polynuclear, with eosinophilic granulation are numerous. In some of them a typical karyokinesis is demonstrable while large megaloblasts showing almost any stage of karyokinesis are not infrequent. Dividing normoblasts are common. Notable is the large number of leucocytes with baso-

philic granulation, the granules being notably smaller than in man. Phagocytic cells, leucocytes and giant cells are very common. Many of the erythrocytes present show very extreme degenerative alterations and free pigment granules are commonly found.

Microscopic Examination. *Cervical Cord*—The membranes of the cord show nothing abnormal. There is slight irritation of the perivascular and pericellular lymph spaces and some of them contain slight exudation of small round cells. The ganglion cells of the anterior horns show no alteration. Segments prepared by the Busch modification of the Marchi method show no degenerated fibers either in the columns of the cord or in the surrounding nerve trunks.

Dorsal Cord. The same changes noted in the cervical cord are also present in the dorsal segments. A few of the ganglion cells show, however, an abnormal brownish pigmentation. No degenerated fibers are demonstrable by the Busch method.

Lumbar and Sacral Cords.—Changes similar to those described above are present. The entire spinal cord as represented by these sections may be said to be practically normal.

Spleen.—The blood vessels are markedly congested throughout and there is a general extravasation of red blood cells through the splenic pulp. The Malpighian bodies show many evidences of acute lymphoid hyperplasia. Extensive areas of pigmentation are present in places, apparently resulting from the breaking down of many red blood cells.

Bone, shaft of femur.—The fatty tissue of the marrow is largely replaced by dense masses of mononuclear and polynuclear leucocytes, fibroblastic and plasma cells, among which are found frequent multinuclear and mononuclear giant cells. Evidences of karyokinetic division are frequent among these cells, but in places fibroblastic cells predominate and a mucoid-like tissue is found replacing the marrow. Osteoclasts are found abundantly at the juncture with the compact tissue and these cells have largely replaced the endosteum and, in places, are evidently causing active resorption of the osseous tissue. Some of the larger Haversian canals in the compact bone are surrounded by osteoid tissue from which the lime salts have evidently been removed leaving the general structure very similar to that of normal bone with the exception that the bone cells have become considerably altered, being

larger, more numerous, and presenting evidences of reproduction. Osteoclasts are absent, except in the larger of these spaces, and the process does not seem to be primarily lacunar absorption.

CASE XI. *Sapajou* (*Cebus hypoleucus*). This animal had been in captivity several years before being deposited at the Park. Paralysis was not a feature of this case and reflexes were present in the hind limbs. On palpation a considerable alteration in the shape of the thorax and especially of the sternum was found. The animal was killed in the early stage of the disease, which probably accounts for the absence of anesthesias of the posterior extremities.

POST-MORTEM SUMMARY.—*Body*—Shows marked emaciation. *Heart*—Normal. *Lungs*—Bronchitis. *Liver*—Congested. *Spleen and Lymph Nodes*—Anemic. *Stomach and Intestines*—Contained considerable partially digested food. Mucous membranes, anemic. *Osseous System*—All the bones softened, easily fractured. The long bones consisting of a thin rim of compact tissue, containing thin gelatinous blood-stained marrow.

BLOOD EXAMINATION MADE IMMEDIATELY BEFORE DEATH.—The blood presented less gross changes than in the previous case, clotted more naturally and was less gelatinous in character. Hemoglobin determined by the Dare instrument showed 74 per cent.

The size of the red cells varies considerably, both macrocytes and microcytes being present. Poikilocytosis is marked, but the relative amount of hemaglobin staining is about natural. Megaloblasts and large mononuclear leucocytes, occasionally showing cell division, are to be found in considerable frequency, and a few normoblasts are also present. No cells showing cytoplasmic degeneration were found.

A few pigmented leucocytes, both lymphocytes and polynuclears were found. The differential leucocyte count shows the following:

Polynuclear neutrophiles	56.5 per cent.
Lymphocytes	35.0 per cent.
Mononuclears	2.5 per cent.
Basophiles	0.5 per cent.
Eosinophiles	4.5 per cent.
Transitionals	1.0 per cent.

CERVICAL CORD.—Membranes of cord, negative. Dilatation of the lymphatic channels, particularly of the perivascular and pericellular spaces. Some of the blood vessels show slight hyaline de-

generation. The ganglion cells of the anterior horns show nothing abnormal.

Scattered degenerated fibres are present throughout the entire transverse section of the cords. They are widely separated and are apparently no more abundant in one column than in another. Collectively they are very few, as compared with the normal medullated fibers.

DORSAL, LUMBAR AND SACRAL CORD.—The changes throughout these levels are similar to those present in the cervical cord.

SPLEEN.—The blood vessels throughout are markedly congested and extravasations of red cells into the splenic pulp are present, in greater or less degree, throughout the entire tissue. Extensive destruction of these cells is taking place and pigmentation resulting from this disintegration is general throughout. The Malpighian bodies in this species appear to be very small, but in places they have been encroached upon by a chronic perarteritis.

BONE, SHAFT OF FEMUR.—The marrow is completely replaced by a dense mass of cells, among which mononuclears and epithelioid cells appear most frequently. Polynuclear leucocytes, fibroblasts single and multinucleated giant cells are also frequent. Normoblasts are found in but relatively small number and extensive destruction of blood cells appears to be taking place, as evidenced by the presence of phagocytic endothelioid cells, the cytoplasm of which is literally crammed with broken down red cells. The endosteum is intact in most places, but in other areas is largely replaced by groups of osteoclasts which are evidently causing absorption of the adjacent compact tissue. The Haversian canals of the compact bone are surrounded by broad zones of homogeneous osteoid tissue which is limited from the compact bone by a fibrous band resembling endosteum. Extravasation of red blood cells into this tissue is present in places, but in other areas it is strictly osteoid in character, though, as a rule, the Haversian vessels in the larger areas are surrounded by cellular tissue resembling that of the marrow. A few of these spaces show an apparent cartilaginous formation resulting in replacement of the vessels and normal tissue. Not infrequently the blood vessels appear to be plugged by hyaline thrombi.

DISCUSSION

DR. HADWEN: I would like to ask about the hair of these animals. I have been very interested in a disease which we think is

close to osteomalacia. In all these cases, the hair has grown tremendously long, and the skin has become very dirty. These were among the first symptoms noticed. Following that there was generally neuritis of the hind parts.

DR. FITCH: I would like to ask Dr. Blair if he has made any blood examinations in these cases; further whether the initial changes are just of the bone, or whether they are changes of the nervous system; whether the changes of the nervous system are just in the cord, or in the sheath of the cord primarily.

DR. BRIMHALL: Do I understand that the bone tissue has changed so that the calcified portion has diminished? Again what would be the cause of fractures in those cases where the bone has lost most of the calcareous substance?

DR. BLAIR: In answer to Dr Hadwen's query, I have not noticed the condition in our animals that he described in the pig. I do not know how to account for the apparent stimulation of the hair in the early stages which you seem to find in the pig.

In reply to Dr. Fitch, I would say that if my paper had been completely read, it would have answered his question fully; I will just report the blood examination of two cases, which will perhaps answer his query.

Of course, since there is no normal standard for hemaglobin and other tests in the large group of animals like the primates, we had in forming our basis to take the conditions as we found them. In case No. 10 or 11, the blood itself showed polynuclear neutrophiles, 67.0 per cent; lymphocytes, 27. 5; mononuclears, 0.5 per cent; transitionals, 3.0 per cent; eosinophiles, 1.0 per cent; basophiles, 1.0 per cent. In the next case the hemoglobin would show 56 per cent. The hemaglobin test in case No. 10 is 65 per cent, and the other 74 per cent.

There was one other question as to why we expect fractures in the bones in which there was so much decalcification. Of course, we never find a bone in which decalcification has entirely taken place; so that the compact tissue really acts as a shell. It is much easier to fracture that thin shell, than if there was no shell running through, and the bone would bend instead of break. The green stick fractures are common, and it is due to that reason.

DR. HADWEN: What are your normal polynuclears?

DR. BLAIR: That is a point we have not been able to determine. There has been no work on that particular thing. I rather think we find it as high as 87 per cent. of hemaglobin in normal animals.

As to Dr. Fitch's other question: we believe that the changes occur first in the bony tissue, and that the changes in the cord are really secondary, due to pressure probably on the sheath; and gradual absorption from that, and the pressure from the deformed bones, rather than a true locomotor ataxia condition.

ABORTION IN DAIRY CATTLE*

W. L. Williams, Ithaca, N. Y.

As early as 1912, I took a position in reference to the contagious abortion of cattle somewhat out of accord with the prevailing views of veterinarians and breeders. Among the more salient statements, or conclusions, at that time were:

(1) Contagious abortion is a widespread—well nigh, if not quite universal—and highly destructive affection of cattle.

(2) It induces many symptoms, commonest among which are sterility, abortion, premature birth and metritis with or without retained afterbirth.

(3) The phenomenon of abortion can not be reliably induced in cattle experimentally.

(4) There is no accurate means for diagnosing contagious abortion.

(5) There is no natural immunity acquired in abortion parallel to that of some acute infectious diseases, such as foot-and-mouth disease, smallpox, etc.

(6) Although the infection may invade the organs of cattle through various avenues, it can induce sterility (when uterine), abortion, premature birth, and retained afterbirth only when a large volume of virulent infection exists in the uterine cavity.

(7) The chief avenue by which the infection enters the uterine cavity is through the cervical canal. The studies of the intervening four years have largely overthrown this belief.

(8) The infection generally exists in the uterine cavity or in the cervical canal prior to conception, or it is introduced at the time of breeding or early thereafter, prior to the sealing of the uterus.

(9) There is no cure for abortion and no means of eradicating the infection from a herd.

(10) Abortion may be largely controlled and its ravages greatly lessened by a comprehensive plan of hygiene, especially of sex hygiene, in breeding and dairy cattle. Developments during the intervening four years have brought forward the care of the new-

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born calf as the most fundamental and essential element in the control of abortion.

The idea advanced that the infection is universal has gained much ground and it is becoming more and more apparent that such phenomena as abortion, metritis, retained fetal membranes, the strong reactions to serologic tests, etc., are not so much dependent upon the presence of the infection as upon its volume, virulence, and location. Schroeder and Cotton, Evans, and others have shown that the milk of many dairy cows is contaminated with abortion bacilli, but how few cows, if any, do not have the bacillus in their milk has not been determined. The more it is searched for, the more found. The wider application of the serologic tests has constantly shown a more and more common occurrence of the infection, especially a more general infection of new-born calves.

During the four intervening years, there has been a notable change in the views of breeders and dairymen in connection with the distribution and frequency of the abortion infection. Many breeders of pedigreed cattle especially are convinced of its universality. They recognize in this a distinct advantage instead of a handicap in their fight with the scourge. They are now viewing the disease intrinsically instead of extrinsically. They are no longer directing their sole care and thought to preventing the introduction of the infection from a neighbor's herd, but are studying critically the dangers within their own herds and gradually introducing measures to control the disease at the center without forgetting the circumference. They are commencing to realize that a belief that their herds are free from the infection is a delusion and a tremendous peril and that their safety lies in the assumption that the infection is present and that only eternal vigilance can prevent it from stealthily assuming virulence and momentum to break unannounced as a relentless storm spreading destruction on every hand.

Researches since 1912 have justified abundantly the addition to the prominent complications of contagious abortion of the white scours and pneumonia of calves. Interesting evidences of the important role of the abortion organism in these affections have appeared in the annual reports of the N. Y. State Veterinary College, especially in that for 1914-15, and yet more convincing evidence will appear in the forthcoming annual report now in preparation.

CHART I.

Vital Statistics of 18 Heifers in Herd A, given Abortion Bacterins in First Pregnancy, with Female Progeny.

Number	Born	1912	1913	1914	1915	1916	Remarks
1	12.6.09	A					Destroyed 10.9.12 Gangrene of the Uterus Decomposition of Foetus
2	10.6.09	A					Died of Metritis
3	2.24.11	S or A	UNSEEN				Slaughtered on account of sterility
4	10.30.10	S or A	UNSEEN	A			Slaughtered on account of Sterility
5	9.6.10	A	A	S			Slaughtered on account of Sterility
6	9.29.10	X B		B H (♀ to A)		B	Slaughtered on account of Sterility
6A	11.8.11			*		B	
7	11.6.10	A	B (twins)	D			Died of Metritis
8	4.26.11	H (♀ to A)					Slaughtered on account of Sterility
8A	12.8.12	*		A			Slaughtered on account of Sterility
9	7.20.10	B					Retained afterbirth Sold on account of inefficiency
10	1.1.11	B	B				Sold account of Bad Udder Gangrene Half Amputated
11	2.5.11	S or A UNSEEN	B	B	B		Sold account of low Dairy efficiency
12	9.22.10	A	H (♀ to A)	B			Died of Indigestion - 1915
12A	11.26.13				H	H	
13	10.5.10	H (♂ to A)	B	H	B		Sold – Efficient
13A	11.27.12	*		A	H	B	
14	10.20.10	H (♀ to A)		B	B	B	
14A	12.9.12	*			H		Sold - Efficient
15	10.18.10	B	H		B B		1913 Heifers died 2.10.14
16	10.5.10	A	B	B	B	H	
17	10.5.10	A	H (♀ to A)	B	H (♀ to B)	H	
17A	9.10.13			*	B	S	
17B	9.8.15				*		
18	12.9.10	A	H (♀ to A)	H	H	B	1914 Heifer died from Indigestion
18A	12.31.13		*			B P	

Died or Killed	10
Sold in Breeding Condition	5
Remaining in Herd of Dairying Age	11

It was stated in 1912 that there is no natural immunity acquired in contagious abortion such as is observed in most acute contagious diseases, like rinderpest and foot-and-mouth disease. Abortion is a chronic disease. The outstanding difference between an acute and a chronic infection is in their power to produce immunity. In acute infections there is an immunity against invasion; in chronic infections there is an immunity against the disease-producing power of a persisting infection. Perhaps that thought can be well illustrated by the use of the chart of the eighteen heifers recorded in 1912 under experiment with abortion bacterins, bringing the history of the group down to date. As recorded in 1912, each of the eighteen heifers received four doses of the then very popular abortion bacterins, in order to test its power to prevent abortion.

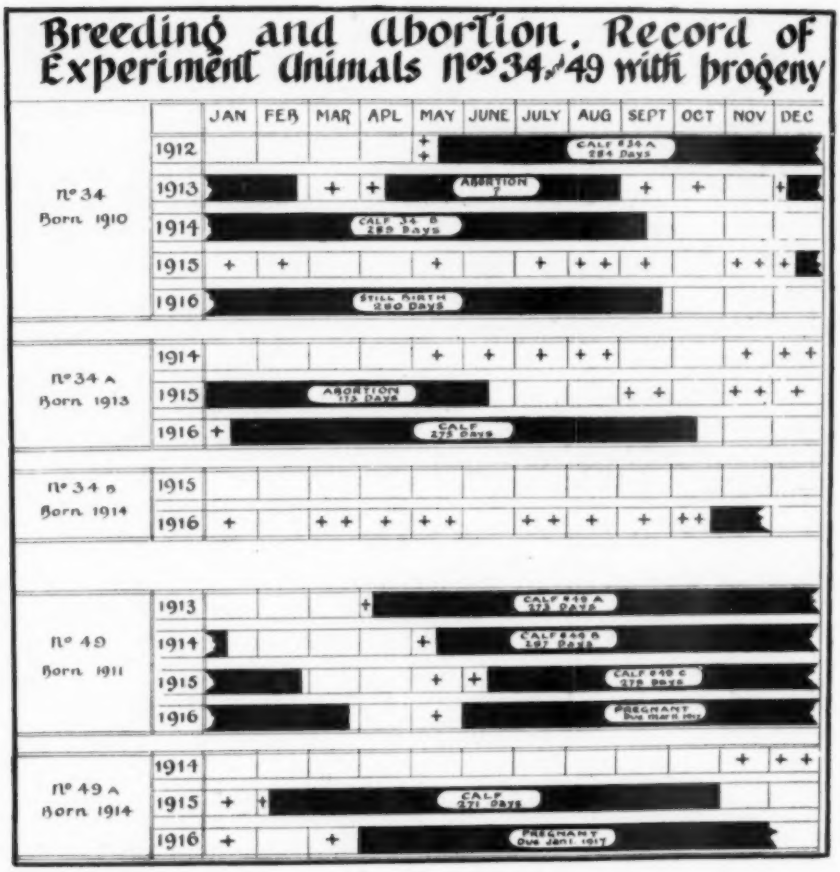
Assuming that each of the eighteen heifers should have calved once a year and that one-half the calves would be heifers, there should now be in milk, counting the eighteen heifers, their daughters, and four granddaughters, a total of forty-nine females. Instead, there exist in the herd eleven females of dairying age, Five cows, presumably capable of breeding, have been sold, and ten have died or been killed. In short, the size of the original group has been diminished by five animals, or 28 per cent., counting in the group all the female progeny of dairy age. This certainly indicates that no valuable immunity is caused by severe infection. Incidentally, also, the charts tend to negate the contention of those now claiming to prevent abortion by hyperinfection prior to conception. These were certainly hyperinfected when two years old, and have been liberally infected ever since. If that would prevent disaster in later years, this group should have become highly valuable.

The principle which I wish to bring out may be further illustrated by Numbers 34 and 49 of our research herd. Each was purchased at birth and has been under constant observation up to the present time.

Number 34, a strong heifer, apparently well, was inoculated in the jugular vein during her first pregnancy with a large volume of abortion cultures. She gave birth at full term to an apparently healthy calf, our Number 101 (No. 34a of chart). She then conceived with difficulty, aborted two or three times unseen, and finally gave birth to a healthy calf, our Number 3 (No. 34b of

chart). After much difficulty, she conceived again, to abort on September 20, 1916, at the 280th day of pregnancy. Following this, she almost died from metritis. Her afterbirth was retained for eight days and when it came away all the cotyledons came with it. Her first calf, Number 101 (No. 34b of chart), in utero

CHART II.



when 34 was inoculated, born 1912, was caused to conceive only with very great difficulty. Apparently she aborted once or twice unseen. Then she conceived, to abort at 173 days. She finally conceived again, to expel prematurely, upon the 276th day of pregnancy, a heifer calf weighing 65½ pounds. Her placenta was retained, and, as in her mother a few weeks before, the cotyledons became necrotic and sloughed away. It required the best

attention we could give them to preserve their lives. Whether they will ever breed again, is a wholly different question.

The heifer calf of Number 101 (No. 34a of chart) was evidently ill at the time of birth. She was dull and appeared in a stupor; she lay down most of the time and refused to eat; her meconium, or fetal feces, was swarming with bacteria; her large intestine was one great cesspool of infection. After vigorous handling with calf scours serum, she rallied and began to grow. She had the infection abundantly when she was born.

The second heifer of Number 34, our Number 3; born in September, 1914, has given great trouble in breeding. She has apparently conceived twice and aborted unseen. Her genital organs are normal, as far as physical examination reveals, but she simply refuses to become pregnant.

Number 49 has been served five times, has produced three healthy calves, and is due to calve in March, 1917. During her first pregnancy, she was fed a liberal amount of pure cultures of abortion bacilli. Since 1913 she has been the constant companion of Number 34. She has also been in the same stable—and in an adjoining stall with an open partition—with the aborter Number 101. She has run in the paddock with her. One of her mates of the same age aborted in the pasture where she was grazing during her first pregnancy. She has been exposed and re-exposed, naturally and experimentally.

The first heifer of Number 49, our Number 1 (No. 49a of chart), bred promptly and calved perfectly before she was two years old. The calf, Number 11, is strong, well developed, and healthy. Number 1 conceived again very promptly, and is due to calve on January 1. The blood of Number 34 has always reacted high; the blood of 49 has always reacted low. The blood tests of the calves of 34 have averaged very high; the blood tests of the calves, even including the second generation, of 49 have always been low. Number 34 and her daughters have always given great trouble in breeding; Number 49 and her heifer have bred promptly.

Number 49 has withstood all the exposure of Number 34, except that her experimental infection was given per mouth instead of in the jugular vein. She has suffered from no serious disaster and has today a higher power of resistance than 34. In other words, the exalted power of resistance—call it immunity or what

you will—has been acquired, not through disaster, not through abortion, sterility or retained afterbirth, but through the avoidance of these.

In 1912 the prevalent belief was that most of the abortion in heifers during their first pregnancy resulted from infection by the ingestion of contaminated food. This I held to be untenable. Its advocates had not designated what food was contaminated, how it was contaminated, or when it was eaten by the animal. The hypothesis was without any secure foundation.

The discovery of the abortion bacillus in the milk of dairy cows shed new and highly important light upon the question of food infection. The calf, in taking raw milk which contains the abortion bacilli, necessarily becomes infected so far as the alimentary tract is concerned. The fact that it has been shown that the milk of many cows is contaminated with the abortion bacillus and the present impracticability of demonstrating that the milk of any cow is free therefrom renders this source of contamination highly interesting. It has been further shown by our researches that such infection occurs. This we have traced with fidelity from the heifer calf at twenty days up to the time that she aborts during her first pregnancy. No other readily acceptable explanation is forthcoming for this persistent infection. Some contend that the infection does not endure for so long, but in our experiment animal Number 34 the severe infection has existed for four years and has only reached its climax. How much longer it may continue, if the animal survives, is merely a guess.

Our experiments in the growing of calves have shed further light upon the method by which the invasion occurs. We have shown that we can change profoundly the character of a calf by the feeding. If we feed one new-born calf, sound at birth, from the very beginning upon boiled milk and another calf, also sound at birth, upon raw milk, the two calves present very marked differences. The calf grown upon the boiled milk retains clean sexual hairs, while that grown upon raw milk has its sexual hairs stained and matted together very early in its existence. The blood of calves which have clean sexual hairs does not, so far as we have been able to determine, react to the tests for contagious abortion, whereas the blood of those calves whose sexual hairs are soiled and matted reacts largely to the agglutination and complement-fixation tests. These differences have not been carefully

investigated and require much study. They have been very largely ignored by most investigators, but a superficial study of these differences should convince the most skeptical of the presence of an actual difference and should incite some study and attention thereto. What that difference is and what it signifies to the breeder and to the sanitarian who believes in clean milk, we do not yet know.

There is no cure for abortion and no means at present by which it can be completely eradicated from a herd. Four years ago, I cited an experiment with the eighteen heifers mentioned above, upon which bacterins had been used. My experiment indicated with great emphasis that bacterins had no value. Bacterins have now been quite universally rejected. They are still sold, but no establishment of high repute is vigorously recommending their use.

Methylene blue was being highly recommended in 1912, and was used very liberally. The cows, the milk, the stables, and to a considerable degree the owners were made blue, but it neither cured nor prevented abortion.

Just at present there is considerable interest in a new plan—the hyperinfection with the abortion bacillus of already infected animals prior to impregnation. The British Royal Commission has suggested this. Under their general plan, Mr. Bland, the Agricultural Organizer for Oxford County, England, has presented some interetsing data which tend to arouse the hope that the plan may prove efficient as a preventive.

One of the most significant items in their data is that regarding a group of 140 cows which had previously aborted. After these were inoculated experimentally with large volumes of highly virulent cultures, they proceeded to abort a second time in higher ratio than cows which had not aborted previously. It must be admitted that the previous abortion was caused by an intense degree of infection. To this was added the large volume of virulent cultures which the experimenters used. Yet the animals aborted more freely than the cows which had not aborted previously. In addition, a very large percentage were sterile or aborted unseen. If the theory of hyperinfection as a preventive is correct, the cows which had aborted previously should, with the addition of yet more infection, be most free from future abortions, but the reverse proved true. This is in harmony with all published ob-

servations. Wherever a cow has aborted once, she is more liable to abort again than is another cow of the same age and under the same conditions which has not suffered from abortion, sterility, or metritis.

Readjusted in harmony with the researches for the past four years, my views regarding the source of the infection and its avenue of invasion may be outlined as follows:

(1) The largest known volume of the infection accumulates in the gravid uterus and is very largely expelled prior to, during, and soon after the termination of pregnancy.

(2) Less in volume than in the uterus, but more frequently recognizable by present methods, is the infection in the milk.

(3) The infection may and does pass through the chorion from the utero-chorionic space, penetrates the amniotic cavity, and is swallowed by the fetus. It may cause fetal diarrhea or may be lodged in the meconium ready to cause white scours or later pneumonia, in the new-born calf. Most calves are born free from the infection.

(4) Infection-free new-born calves generally or always ingest the infection with their milk, either from the interior of the udder or from the exterior of the teat, which has been soiled from the discharge from the genital tract. The latter source is far more dangerous. If the dam or nurse cow is not severely infected, the calf thrives well and presents no evidences of disease: its blood does not react, or reacts very low. If the cow is ill from metritis or retained afterbirth, the intense infection of the calf after birth, as well as before, is more probable, and the severity of the infection tends to be greatly increased. The infection is intensified, especially in dairies, by the use as calf food of unmarketable milk from badly diseased cows. The intensity of the infection is greatly heightened and assured through the feeding of mixed, or composite milk, by which the calf is exposed to the most virulent infection in the herd, and still more injuriously when it is fed upon raw skimmed milk and whey from creameries and cheese factories, by which means each calf is exposed to the most virulent strains of the abortion bacillus in the community. It is this exposure which is chiefly responsible for the constant increase in virulence of the disease in dairies, in contrast with the lesser frequency in beef cattle, where the calf is exposed usually to the milk infection of its dam only.

(5) The cohabitation of evidently diseased with apparently sound cows; intermediary bearers, such as attendants and visitors; and the contamination of the food of adult cattle play a minor role in the dissemination of the disease.

(6) The bull plays an important role. Definite experimental proof of this is wanting and the clinical evidence is contradictory. The bull must at least be a more probable carrier than an attendant. Logically, we cannot expect an infection of the genitalia to be unisexual. The bull would naturally tend to be less seriously involved than the cow, and his blood generally reacts more feebly than that of the cow.

(7) An abortion storm may be aroused in a herd intrinsically through unfavorable conditions within the herd or extrinsically through the introduction of new cattle of either sex from herds having a more highly virulent type of infection.

These views regarding the source and course of the abortion infection inevitably clash with the old, and still generally held idea of the efficiency of the isolation of aborters in the control of the disease. In my clinical experience handling sterile cows, the frequency with which I find a dead embryonic sac lying in the vagina or in the cervical canal and other evidences of a most convincing kind teaches me that probably less than 50 per cent. of the actual abortions are seen. Just how anyone can bring himself to believe that isolating 50 per cent. of the aborters from a herd will eliminate the disease, I cannot understand.

Again, I find a necrotic mass of fetal membranes protruding into the vagina through the cervical canal, and all about it a voluminous discharge taking place. The anterior portions of the fetal sac and the fetus are alive. The discharge from the cervix has evidently existed for weeks. There are no exterior signs of abortion and no rule for isolation. The animal is not known to be an aborter. Finally she aborts a tiny fetus in its membranes, and the uterus is at once well nigh clean. Now comes isolation—if the abortion is discovered, which occurs in less than one per cent. of such cases. The cow is cleaner and safer than she had been for weeks. I do not understand how isolation, after most of the infection has been discharged, can control the disease.

Sometimes I find a cow carrying a fetal cadaver for one or two years, fetal debris and uterine discharges all the while escaping without attracting attention. She has not aborted; she is in

no danger of aborting. She would be more fortunate if she could abort. The isolation scheme does not demand her segregation.

I see cows which carry their calves to full term and expel them alive. For some time prior to calving, they expel pints, quarts, literally gallons of the typical exudate of contagious abortion, but they do not abort. Still, they expel more abortion exudate than twenty cows which abort in early pregnancy. These cows have not aborted and are not subject to quarantine.

Sometimes I see a cow calving prematurely or at full time. Because of the metritis of contagious abortion, she has retained placenta and between the membranes and uterus a great mass of the typical exudate of contagious abortion. Her failure to abort leaves her in the herd, discharging far more virus than most aborters. Her live calf is infected at birth and soon has the dysentery or pneumonia of contagious abortion. Quite naturally, the calf has not aborted or been aborted, and under the rules is not subject to quarantine, but it spreads disease and disaster in the calf stable. From such cases down to the point where acceptable evidence of infection vanishes, is every gradation. The sanitarian who would control contagious abortion by isolation places himself at once between the Scylla of attempting control by removing a pitiable minority of dangerous animals and the Charybdis of practically or completely emptying the stable. The futile process of isolating aborters to control abortion has been the cornerstone in the handling of this scourge for at least fifty years, and the results are so evident to-day that one may well wonder why the plan is still advocated by anybody.

Instead of the isolation of aborters, I have advocated for some years a plan of control based upon the conception, outlined above, of the disease.

(1) Guard and protect the new-born calf. Bathe and disinfect the cow before calving and place her in a clean stall. Remove the calf immediately after birth. Cleanse and disinfect the udder and neighboring parts before permitting the calf to suck or drawing milk for it. Keep the calf upon the raw whole milk of the dam or of a selected cow for eight to ten days, and thereafter feed upon sterilized milk, which may be skimmed, mixed, etc. This limits the milk exposure to that from one cow and to the first eight or ten days of the life of the calf.

Keep the calf isolated as long as practicable. If it develops

scours or pneumonia, proceed vigorously to cure it at once, if curable or worth curing; if incurable or not worth curing, kill it and dispose of the cadaver as a menace to the herd.

When the calf reaches breeding age, mate heifers with healthy bulls grown in the same manner. Before breeding, cleanse the genitalia of both sexes as carefully as practicable.

(2) When metritis exists and causes sterility, abortion, premature birth, or retained afterbirth, cure the metritis—cure it promptly and well—or send the cow to the butcher. Examine the genitalia of all suspicious cows often enough to keep track of the pathological conditions present. If the disease of the genitalia (ovaries, oviducts, or uterus) is incurable, slaughter the cow; if curable, cure her. Do not permit the herd bull to serve a cow which can not at that time conceive. Copulation intensifies the infection in the cow and imperils the health of the bull.

(3) Protect the bull by douching the external genitalia regularly before and after service.

(4) Do not introduce into a herd, except when absolutely necessary, new animals of either sex which may bring into the herd a more virulent strain of infection than that already present. In other words, keep no dangerously infected cattle of either sex or of any age in the herd. If they become diseased, cure them promptly or kill them as a menace to the herd.

In 1912, we referred to a dairy designated as Herd B. Some interesting things have since occurred in that herd.

In 1912 the management, thoroughly disgusted with the losses from white scours and pneumonia in calves and the abortion and allied complications in heifers pregnant for the first time, sold all unbred heifers and heifer calves, and began anew the effort to grow heifer calves with which to replenish the herd. Previously they had handled their calving cows in the usual manner. They had taken them out of the milking barn, and placed them in box stalls where they were fed and watered. When they had calved, the calf was left with the cow for a few days and allowed to suck at will. Then it was removed to a large calf barn, where it was placed with many other calves and fed upon mixed pasteurized milk.

Then they changed their plan. Before the cows calved, each was given a thorough bath with soap, water, and a disinfectant. She was then placed in a carefully cleaned and freshly bedded

CHART III.

Calf Scours and Pneumonia, and Abortion and Sterility in Herd B.

Time Covered	Heifer Calves Born		Died of Scours and Pneumonia	Sold as Sterile	Killed account Tuberculosis	Miscellaneous Deaths	Sold for Veal	Conceived	Pregnancy terminated		In Herd Pregnant	In Herd not Bred
									Calved	Aborted		
May 1. 1909 to Aug. 31. 1912 40 Months	593	No	184	8	56	57	118	170	95	75	0	0
		%	31	1.4	9.4	9.6	19.9	27.8	55.9	44.1	0	0
Sept 1. 1912 to Oct 31. 1916 50 Months	904	No	203	6	13	58	0	382	203	22	157	245
		%	22.4	0.6	1.3	6.4	0	44.2	90.2	9.8	17.4	27

box stall and care was taken to keep her moderately clean about the buttocks, tail, and udder. The calf nursed ten days, and was then placed in the calf stable and fed somewhat more carefully than before. The milk was more carefully pasteurized. The mortality in the new-born calves was lowered from 31 to 22.4 per cent.—an improvement of 8.6 per cent. in the total number of heifer calves born and a diminution of the mortality from calf scours and pneumonia of 28 per cent. A parallel diminution in miscellaneous deaths followed promptly. Tuberculosis in heifers decreased markedly, but other causes were affecting this problem and involving a general decrease in tuberculosis in the herd.

When the heifer calves grown under the amended plan reached breeding age, a very marked change was apparent. They conceived more uniformly and far more promptly. The plan in each group was to breed at fifteen months and have them calve at twenty-four months. Temporary sterility in the first group delayed the average termination of pregnancy three months, or until the heifer was twenty-eight months old; in the second group the average age at calving has been twenty-five months, while permanent sterility has almost vanished.

When the pregnancies began to terminate, the contrast between the two groups deepened. In the first group the calving rate was 55.9 per cent. against 90.2 per cent. in the second group; the abortion rate in the first group was 44.1 per cent. to 9.8 per cent. in the second group. Lack of time forbids details, but throughout the seven years covered by the data there has been a surprising harmony between the mortality from calf scours and pneumonia during the first ten to fifteen days of life and the rate of abortion when the surviving heifer calves become pregnant. The harmony has not been limited to the one phenomenon. The scours and pneumonia inevitably laid the foundation for some of the mortality classed as miscellaneous. Accordingly, once the scours mortality is reduced, although scours is only partly due to the abortion bacillus, the entire symptom-complex of the disease—sterility, abortion, metritis, and retained fetal membranes—is favorably affected.

A close study of the subject up to the present time reveals no other explanation for this remarkable change in the abortion rate of Herd B. It is not one of those unexplainable depressions in the abortion rate in the herd. If it were, the drop in the abortion

rate would include the adults, which it does not. During the period of the first group, the abortion rate was 44.1 per cent. in the first pregnancies and 16. per cent. in the third or later pregnancies, while in the second group the abortion rate in first pregnancy was 9.8 per cent. against 12.2 per cent. in adults. The ratio between abortion in heifers and in adults has been reversed. The two groups of heifers have been kept in the same stables, paddocks, and pastures; cared for in the same manner by the same group of attendants (of constantly shifting personnel); fed upon the same character of food from the same sources; watered the same; and when four to seven months pregnant are placed in the same stables with the original herd, where abortion has always prevailed. As they were not milked, the danger from infection through the udder needs be regarded as of minor importance, with no difference of exposure between the two groups. The bulls used for the two groups were in general the same, except that some of them were grown with the heifers in the same manner, which merely reverts to the calf feeding as in the heifer calves.

Search as one may, the only explanation appearing is the change in the care of the new-born calf, and what is more interesting and withal highly suggestive in the problem of the production of clean milk is that the principal effect of the change is not upon the milk within the udder, but upon the contamination from the exterior of the udder. The data suggest that the genital discharges flowing down over the udder and teats and sucked in with the milk by the calf contsitute a very serious menace to the life and health of the calf, tending to cause scours and pneumonia early in life, and that, if the animal survives this ordeal, the infection persists, to awaken the whole symptom-complex of contagious abortion when the heifer reaches breeding age. Yet it is neither unreasonable nor strange. In cases of retained fetal membranes, a bacteriological search of the placental structures and of the meconium of the new-born calf, according to the researches of my colleagues Fitch and Hagan, tend to give identical findings. Sometimes the fetus suffers from the scours. If the intra-uterine infection can pass through the chorion into the amniotic fluid, be swallowed by the fetus and cause fetal diarrhea or be held in store until after birth, to cause calf scours, surely that same virulent infection flowing down the escutcheon, thigh, and tail onto the udder and teats, where the calf must inevitably swallow it with its first mouthful of milk, must be a serious peril.

Theories upon the source, avenue, and era of infection of contagious abortion are many, conflicting, and confusing. What the breeder and dairyman desire most is not theory, but definite constructive work in the dairy itself. The data upon the fifteen hundred heifer calves in Herd B, following them through their first pregnancy, constitute the cleanest cut, most comprehensive, and most encouraging chapter ever recorded in the battle against contagious abortion in cattle. These data cannot well be ascribed to chance or overthrown by elaborate theories. The only thing which can or will affect them in the least is a clear, logical explanation other than that offered for the difference in the two groups of heifers.

LABORATORY MILK AND MEAT INSPECTION*

DR. J. F. MITCHELL, Anaconda, Mont.

The number of diseases that it is possible for people to contract from milk is large, for be it remembered that not only those diseases from which both cattle and man suffer are included, but also the human diseases that can be spread to other human beings by means of milk and water. These diseases in the order of their importance include the following: infantile dysentery, typhoid fever, tuberculosis, diphtheria, scarlet fever, septic sore throat or pseudo-diphtheria, scarlatina, Malta fever (goat's milk), milk sickness or para-typhoid. It is possible to contract many other diseases from milk, among which are the following: foot and mouth disease, pus infections, verminous troubles, smallpox, syphilis (a friend of mine told me of a case in which he found a dirty syphilitic man milking), contagious abortion, anthrax.

The number of these possible diseases could be increased very greatly.

The main avenues by which milk becomes infected are the following:

> From the udder of the cow; here the milk picks up only a very few of the germs we find later in our bottles. Tuberculosis, pus infection and Malta fever are the main ones.

*Presented at the meeting of the Montana Veterinary Medical Association, January 6, 1917, Missoula, Mont.

From dirt on the cow's sides, loose hair, and stable air are collected tuberculosis and pus organisms.

From the hands and clothes of the milker can come any of the human diseases—tuberculosis, typhoid fever, diphtheria, etc.

Dirty bottles, dirty cans, and filthy wash water supplies are all important factors and to every one have been credited typhoid outbreaks.

In the distributing depots we come in contact with the same dirty utensils and human agencies again.

One of the most flagrant sources of typhoid infected milk has been the wash water supply of the dairies. Fifty-four epidemics have been traced to this source alone. Only one other source of infection has so great a number and that is, epidemics caused by milkers or dairy attendants who are actually attending to milk directly or indirectly when they have the typhoid fever.

Milk is an ideal medium for germ propagation; while milk in the cow's udder is rarely sterile, still this source of infection is insignificant in comparison with outside contaminations. When milk is once contaminated, there is no practical way of getting the germs out again; all we can hope for is to decrease their rate of multiplication by keeping the milk cool, or by pasteurization to decrease their numbers, followed by cold.

The history of one outbreak of milk-borne typhoid fever will illustrate what sometimes happens:

"Elkton Epidemic: Elkton, Maryland, had a population of 2,542. The town water supply was obtained from Elk River about 1½ miles above the town. Part of the families drank the town water, the rest used private wells. The inhabitants were supplied with milk from 4 dairy farms having routes in the town. Dairyman B, on his way to town each day with his own milk obtained an additional amount from 2 other farmers, C. and D., both of whose farms remained free from typhoid. In September 1900, a case of typhoid fever occurred on farm A. adjoining farm B. Mrs B., wife of the dairyman, assisted in nursing the case at A. for two or three weeks up to October 5th. For some days before this Mrs. B. and one of her sons had been ailing, but the boy continued milking and the mother handled the milk up to October 8th, when both became too ill to work. (Later another son fell ill.) Previous to this time, there had been in Elkton only 3 cases of typhoid and they were all in one family, occurring August 12th, September 12th and September 19th. On October 11th, 3 cases of typhoid fever were reported; 12th, 1 case; 13th, 2 cases; 14th, 3 cases; 15th, 3 cases; 16th, 3 cases; 18th, 6 cases. By October 28th, 32 families had been invaded. All used milk supplied by B., 18 used the town

water supply and 14 private wells. The total number of cases was 39. On this day B. stopped selling milk and in three weeks the epidemic subsided. The final summary of the outbreak was:

"Invaded houses 39; all used B's milk, 21 used public water supply, and 18 used private wells. B. claimed to supply regularly 80 houses with milk. One hundred and eighty people lived in the 39 invaded households.

"There were several occurrences during this outbreak of special interest. Miss M., living in New Jersey, visited Elkton for two days, October 5th and 6th, returning home on the 7th. While in Elkton she was at a house supplied with milk from B's farm. No typhoid had occurred at this house up to that time. On October 14th Miss M. fell ill with typhoid. In one family a negro servant, whose chief food consisted of oatmeal and milk, left Elkton the middle of October and went to Glasgow, Del., where she became ill of typhoid and died. In another family was a married daughter who left Elkton the last of October to visit friends. In about ten days she fell ill with typhoid. At the jail there were from 15 to 20 prisoners who received no milk whatever, 3 members of the jailer's family, and 2 men assisting about the place, all of whom used B's milk in one form or another, fell ill with typhoid, while the prisoners were not attacked."

In all milk-borne outbreaks, the disease follows the dairyman's route. It is usually of an explosive character; that is, a number of cases develop at approximately the same time, because relatively speaking, an infectious disease develops in all people in the same length of time.

Milk drinkers are more affected than other members of a family (this usually means children, invalids and women).

All of our Board of Health records should show the relation of contagious diseases to milk routes, whether they are supplied or not.

In Bulletin 54, put out by the Public Health and Marine Hospital Service, published 1907, there is a series of tables which give a number of milk-borne epidemics that have been directly traced to milk:

"MILK-BORNE EPIDEMICS"

Disease	Number of outbreaks	Number of cases	Number of deaths
Typhoid fever.....	188	10,848	926
Diphtheria.....	28	1,456	386
Scarlet fever.....	51	2,095	7
Sore throat or pseudo-diphtheria.	7	333	...
Scarlatina.....	23	1,142	270

Two of the most widely distributed milk-borne diseases are not included in these tables—tuberculosis and infantile dysentery.

The separation of the cases of bovine from human tuberculosis is neither easy or absolutely exact. Park and Kumvide have made a table of more than a thousand cases in which 10% of all cases of tuberculosis are traced to the bovine type. 26% of the cases between 1 and 16 years are bovine. Tuberculosis is probably the most widely spread of cattle diseases. It could almost certainly be detected in the milk supply of any of our cities. The tuberculin test and pasteurization are our greatest safeguards. A rigid physical examination of many tubercular cows and some dangerous spreaders of this disease will not always reveal the culprit. In England for some years samples of the milk of tuberculous cattle were injected into guinea pigs in order to find out whether the animal was passing tubercular bacilli with her milk. A guinea pig will develop tuberculosis in from four to six weeks following such an injection. Four to six weeks, however, is a long time to deprive a dairyman of a cow's milk, or to drink such milk if it be tubercular. And, when one adds that the test is not infallible, that the guinea pigs often die of other diseases and that a cow may become dangerous at any time, the test is very unsatisfactory. I know of no quick satisfactory way of telling whether or not a sample of milk contains tubercular bacilli.

The largest single factor in the death of children under one year of age is gastro enteritis. This is largely due to improper feeding and dirty milk. The number of lives that Mr. Nathan Strauss has saved and will continue to save for New York City is very great. This has been brought about by establishing in that city depots where mothers can get clean pasteurized milk, modified according to a physician's prescription, with a result that the death rate was reduced 47% in children during the hot summer months, according to an article I read in October. Strauss depots during the first half of 1907 distributed 2,917,336 bottles and 1,222,045 glasses of milk. Twenty-two large cities in this country have infant milk depots (1907); their number is increasing. For adults the dangers of drinking badly infected milk is comparatively slight, but for children and invalids, they are very great indeed. The means by which a city may protect itself from contaminated milk are not as efficient as one would hope for. A thorough, careful, conscientious inspection of dairies, followed

by laboratory analysis of the product, with the co-operation of the dairyman, does not always prevent epidemics. Walking typhoid carriers and diphtheria cases cannot easily be diagnosed. However, such inspection certainly helps to give us what we all want—a pure milk supply at a reasonable cost.

There are two main methods for the analysis of milk. I will divide them into the chemical and bacteriological. In the chemical analysis the things ordinarily looked into are: butter fat content, total solids, presence of water and of preservatives (boric acid and formalin) and the acid content. In the bacteriological analysis: the number of bacteria per cubic centimeter, dirt content, temperature, and the age at time of delivery.

The particular varieties of germs in milk are not often taken into account. However, the presence or absence of the *B. coli* group of organisms is fairly easy to establish, and upon it rests the likelihood of typhoid infection. Some of the specific causes of other diseases can be found by cultures on different kinds of media or by animal inoculation.

I have made an estimate of the laboratory equipment necessary for a small city. In taking this matter up, I am figuring that bi-monthly examinations are sufficient; that all counts be made after 48 hours incubation; that in the larger towns the samples be collected for the analyist.

With the following equipment I feel very sure that I could do well the routine laboratory analysis necessary for Anaconda, and by adding more pipets, Petri dishes, media and an electric driven centrifuge ($75) one could do the work of any town in the state. This work would take about one-fourth of a man's time, figuring he can catch one-third of the milkmen at a time. A person would have to spend 6 days getting the samples and making the analysis. Any trip to the dairy plants would be aside from this.

These analyses would cover the following: bacterial count; age; dirt content; temperature; specific gravity; presence or absence of water; butter fat content; acid content; chemical tests for boric acid and formalin.

Of course, where a dairy is running a high count and it is necessary to take samples from all utensils and all the cows, the local man might need help from the central state laboratory. In case of a severe epidemic of any of the milk or water-borne disease, he certainly would need help.

The amount of time an inspector would have to spend inspecting dairies, I know very little about, for although I have done this work for other men, I have never officially had charge of that end of milk inspection.

LABORATORY EQUIPMENT NECESSARY FOR A SMALL CITY

BACTERIOLOGICAL EQUIPMENT:

Incubator (Arthur H. Thomas Phil. No. 3 9x9x12)	$20.00
Hot air sterilizer (No. 1128 Spencer Lens Co.)	15.00
Petri dishes @ 30 2 doz. No. 1586 (Spencer Lens Co.)	7.20
1 c.c. pipets @ 8 2 doz. B. & L. 15956	1.90
Thermometer 1 16950 B. & L. 0-360	1.80
Media agar 4 doz. tubes (1 month's supply)	3.00
Sediment tester (The Creamery Package Mfg. Co.)	3.50
Alcohol stove (Sparrow's Drug Store)	.25
Alcohol for lamp, 1 gal	.75
	$53.40

CHEMICAL EQUIPMENT:

Centrifuge (Argos 6 bottles hand power 15736 B. & H.) (An electric driven centrifuge costs from $45 to $75)	$9.00
Milk bottles, 1 doz., (I. I. C. Co.)	1.00
Cream bottles ½ doz., (I. I. C. Co.)	1.00
Skim milk bottles .. doz., (I. I. C. Co.)	1.80
15 c.c. graduated tube, ½ doz., (I. I. C. Co.)	1.00
Milk pipets, ½ doz., (I. I. C. Co.)	1.00
Cream pipets, ½ doz., (I. I. C. Co.)	1.00
Lactometer (new design) 15730 B. & L.	1.00
Buret 1568 (Spencer Lens Co.) 50 c.c.	1.00
Phenolphthalein 1 oz., B. & L.	.25
1-10th normal sodium hydroxide 1 liter	1.00
Hydrochloric acid B. & L., 1 lb	.15
Test tubes, regular 1922 16x120 mms. B. & L.	1.35
	$20.50
Grand total	$73.95

The incubator in this outfit may be omitted if the Petri dishes are held 5 days at room temperature before being counted.

The cost of inspections for the certified dairies supplying San Francisco, Oakland, Alameda, Berkeley, and some smaller towns, are borne by the dairymen themselves. They pay $5.00 for two bacterial counts, $5.00 for two chemical analyses, and $10.00 for a dairy inspection per month. I used to make the bacterial counts for these dairies; there was a good deal of profit in it. What pro-

portion of an inspector's salary should be paid by the dairies themselves, is, of course, problematical; certainly some of it should in one form or another. A fair fee for a complete analysis where there are a number to be made regularly would be $2.50 per sample, transportation expenses being allowed. I have on the table here, the equipment (or cuts of it) that I consider necessary, and also some Petri dishes showing colonies of bacteria; the milk corresponds to the grades of certified, pasteurized and regular market milk. Later I will be glad to demonstrate these to anyone interested.

The standards that a city should require of a milk supply are problematical. They would depend on the size of the place, season of the year, age of the milk, etc. The state has a standard for butter fat, total solids, etc. It seems best to follow the state laws as the enforcement of city ordinances where they conflict with those of the state has not been very successful in California.

The following are the bacterial standards put out by New York State (1907):

Certified milk.....	10,000 per c.c. or less
Inspected milk.....	25,000 per c.c. or less
Market milk, in winter....	100,000 per c.c. or less
Market milk, in summer...	1,000,000 per c.c. or less
Pasteurized milk.....	500 per c.c. or less

The bacterial content of milk is sometimes obtained by taking a definite quantity, diluting it a definite number of times, spreading a certain thickness of the result on slides, and then staining with methylene blue and counting with a microscope. The results are just fairly satisfactory. One reason that these counts do not seem to compare with the bacterial plate method is that one counts not only the germs that would grow on the plates, but also many germs which do not grow under these conditions, together with dead germs. Therefore, microscopical analysis gives you a higher number of bacteria per c.c. than the plate methods. The regular method of obtaining the bacterial content by the plate method is the following:

To 100 c.c. of distilled sterile water are added 1 c.c. (16 drops) of milk to be examined. This is shaken 25 times to thoroughly mix the milk and water. 1 c.c. of this diluted milk is then added to a Petri dish, half a c.c. to another Petri dish, and 2 c.c. to a third. Agar culture media is then poured into the dish and let

harden. These plates are then incubated at blood temperatures for 48 hours. Each germ is supposed to grow and these germs form colonies of such tremendous number that the individual colonies can be seen and counted with the naked eye. Some of these plates are on exhibition on the side table. The rate of bacterial multiplication is stupendous. From one typhoid germ dividing once every 15 minutes, which is the normal rate for their reproduction, 39,525,722,084,154,878,141,463,175,168 develop in 24 hours. A germ varies anywhere from a circular globule ½ of 1-25000th of an inch across to one that might be 15-25000ths of an inch across.

The pasteurization of milk is advocated by many people because it insures greater safety to milk consumers. By pasteurization of milk is meant the heating of it to such a point that the bacterial count is greatly reduced, followed by rapidly cooling the milk. Pasteurization protects the consumer from milk carrying tuberculosis, diphtheria, scarlet fever, typhoid fever, etc., and so reduces the numbers of ordinary bacteria that infantile intestinal diseases are greatly reduced in numbers. While doing this, it increases the keeping qualities of milk. To offset these advantages, pasteurization increases the cost, perhaps decreases the digestibility and promotes carelessness in handling. The advantages certainly offset the disadvantages. Although the gross number of bacteria is very important, especially to children and invalids, the kind of bacteria is more important. If a few of the small number of bacteria in certified milk were typhoid germs, the danger in such milk is much greater than in milk with a million germs to the cubic centimeter provided the latter has no specific disease germs. For this reason pasteurization of certified milk is advocated by some people. Very dirty milk should not be pasteurized because it improves its keeping qualities, and thus enables the dealer to sell it. One other advantage in pasteurization is that in most plants, it enables the milk to be clarified at a very small additional cost. Any one who has seen the slime and filth that accumulates in a separator or clarifier bowl will appreciate that this is something that really should be done. I have seen a good many people after once having caught sight of such a mass of filth, swear off the drinking of milk forever and aye.

There are two processes of pasteurization: The "flash" or instantaneous process and the holder process. In the "flash"

process the milk is heated to 160 to 165 degrees F. for from one-half to one minute, then cooled immediately and bottled. This process is, on the whole, unsatisfactory, because to heat milk to this temperature, the medium by which this is done, is so hot as to cook part of the milk, while it is possible at least, if not actually probable, that some of the milk never reaches the pasteurization temperature. Cooking milk decreases the digestibility, injures the taste and the cream line, thus injuring the selling qualities.

In the holder process, milk is heated to 140 to 145 degrees F. and held at that temperature for thirty minutes, then cooled and bottled. Some plants heat their milk to 155 or even 160 degrees. If this process is properly carried out, pasteurization is complete. The milk retains its normal taste, digestibility and cream line. The holding of milk at 145 degrees F. is sometimes done in big vats, sometimes the whole process is carried out in bottles similar to the way beer is treated. In the bottle method the bottles are filled, capped, and then heated to the desired temperature, and later cooled. This is probably the most efficient way of pasteurizing milk, for in doing this, one cuts out the bacteria that get into milk during the bottling process and those in non-sterile bottles—not an inconsiderable number. However, this is the most costly of all processes. One way of reducing the cost is to bottle the milk hot and cool it in the bottles.

There are on the market a great number of pasteurizers that can be used in the holding process. These cost anywhere from a couple of dollars to several thousands. In the simplest ones, milk is heated on the stove in some sort of a double bottom container, then cooled by placing this container in running water. A small commercial pasteurizer of about 30 gallons capacity can be purchased for about $70. This consists of a little boiler to furnish steam and a starter can for heating and cooling milk. A starter can is a double jacketed affair between the walls of which hot water and later cold water can be circulated, with some sort of an agitator inside to mix the milk during the process of pasteurization. In some of the more complicated machines, the milk is heated by a revolving hollow tube placed in some sort of a vat. Through this tube is first passed hot water and later cold water and brine. A machine of 200 gallons capacity can be purchased for $350, not including the boiler or the bottling machine. The capacity of this machine can be doubled by running the milk in

the tank over one of the many milk coolers that are on the market instead of holding it in the original vat to cool. Such a cooler would cost $35 to $75. A complicated machine which consists of a milk clarifier (a centrifugal machine that filters the milk and removes all dirt), a pasteurizer which automatically heats the milk to 140 to 145 degrees F., a holder tank of 5 sections which automatically holds milk for 30 minutes a section, a cooler that cools the milk to 45 or 50 degrees F. and a bottling machine, capacity 60 quarts a minute, which automatically fills and caps the bottles, costs $2200. This does not include the boiler. They have such a plant in Anaconda and it does do the work.

I have with me several bulletins put out by the U. S. government and catalogues from dairy supply houses which, of course, go more thoroughly in detail about these machines. I will be glad to show them to anyone interested.

The relation of the laboratory to meat inspection is not nearly so close or so important as to milk inspection. Practically all meat is passed or condemned by macroscopic not microscopic inspection. However, where an inspector is not sure of his diagnosis, or where an owner is not satisfied with the inspector's diagnosis, they both have recourse to a laboratory. Here sections of the diseased parts are taken; these are usually cut into very thin slices, about 10-25000ths of an inch thick, placed on glass slides and stained to bring out the abnormal qualities and examined with a microscope. Some diagnoses can be made, for instance trichinosis in pork, by simply taking a portion of the diseased diaphragm and crushing between two glass slides and looking at it with the microscope, with or without staining. A few definite diagnoses can be made by simply smearing some of the discharge from a lesion upon a slide, then staining, after which, by the aid of a microscope, the cause can be found, as for instance the ray fungus, the cause of lump jaw in cattle.

The necessary apparatus to do this work is expensive and unless it could be used for all Board of Health work would not be justified in a small town. When once fitted up, however, such a laboratory would be capable of doing sputum, typhoid, diphtheria, stool, tumors, and similar work for the medical and veterinary practitioners in town.

MEAT INSPECTION LABORATORY APPARATUS

Microscope B. H. 8	$70.00
Mechanical stage, Model B, B. & L.	16.00
Table microtome 3050 B. & L.	12.50
Ether or rhigolene freezing attachment 3080 B. & L.	8.00
Section knife 3120 B. & L.	3.50
Black strop, coarse 3164 B. & L.	2.00
Black strop, fine 3168 B. & L.	2.00
Yellow Belgian hone 3182 B. & L.	1.50
Blue green hone 3186 B. & L.	1.00
Miller's water paraffin bath B. & L. 3206	15.00
Paraffin 2 lbs 43 degrees C.	.30
Paraffin 2 lbs 54 degrees C.	.36
95% alcohol 2 gal.	6.00
Absolute alcohol 3 lbs.	4.05
Alcohol lamp 8 oz. 3218	.20
Formaldehyde 40% 2 lbs.	.40
Bealser's copper 12480 250 c.c. and 1000 c.c.	1.95
Stains Fuchsin 10 gram	.25
Stains Eosin A. G. 10 gram	.35
Haemotoxylin, chem. pure cryst. 10 gr.	.65
Methylene blue (Koch) 10 grs.	.30
Box of cover glasses	1.00
Bealser's nested 1-10 B. & L. 12490	2.80
Box of microscopic slides	2.00
Conical graduates 14944 1000 c.c.	1.80
Cylinder graduates 13622 100 c.c.	.60
Cylinder graduates 13622 25 c.c.	.35
	$147.86

There are a good many things that would be useful that are not listed above, but the essentials, I think, are there. If you add this equipment to my first lot, the cost is $221.81. The result would be a better laboratory, capable of doing a greater variety of work than is found in most hospitals.

—The Ontario Veterinary College has the record for sending the largest number of its graduates into the Army Veterinary Service. About 200 men are at the front or on their way, and requests are coming in for more "men who know something about horses."

FOOT WOUNDS*

A. L. Danforth, Watertown, N. Y.

The request of our secretary for a paper on some practical subject gave me, I will admit, a wide field from which to choose. Probably nothing new will be offered in the line of treatment of foot wounds, but it occurred to me that this together with the discussion following, might be of interest to those of us at least who are in general practice in the larger towns.

Nature has splendidly equipped the feet of the horse as well as the cow with a tough, horny covering, and in the horse man has for centuries further protected these with shoes of various styles and shapes, and, I might add, applied with various degrees of skill, although I have no intention of dwelling upon the subject of shoeing. Regardless of this protection afforded by both Nature and man, there is no part of the horse's anatomy which is so liable to injury and which causes the horse so much suffering as his feet.

For the sake of convenience we will roughly divide these anomalies into two classes; first, those chronic conditions caused by faulty conformation, bad shoeing and concussion, such as side bone, ring bone, laminitis, etc., and second, those acute injuries due to nail and calk wounds, corns, acute laminitis, wire cuts, etc., and we will devote most of our time in this paper to the ones last mentioned.

Probably a large majority of the injuries to the feet are caused by puncturing the non-sensitive and sensitive laminae by nails or similar objects such as bolts, screws, glass, etc., and the handling of these involves in many cases a great amount of patience and hard work, and if we do our work well we certainly earn our money. These wounds are in nearly every case badly infected, and many times have been left until all the home remedies, such as cow manure poultices, spirits of turpentine, soft soap, etc., have failed, and when we are called we find a badly infected wound which demands more or less radical treatment, varying of course with the extent of the wound and the intensity of the infection. By far the greatest number of nail punctures are located along the lateral clefts of the frog and in my experience the more anterior their lo-

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cation, the more satisfactory their termination, the most troublesome ones being those near the base of the frog. In those cases where the sensitive laminae are only slightly injured and where attention is promptly given, we will have but little difficulty. Free opening with cauterization and a protective covering will usually suffice. But where the puncture is deep, injuring the os pedis or plantar cushion, where the infection is virulent and the wound has been neglected from one to several days, we will, of course, be guarded in our prognosis. These cases call for careful judgment and, in many cases, a great amount of hard work. The difficulty of attaining and maintaining asepsis, and often the intractability of the patient is experienced. I make it a practice to begin by removing the shoe and the entire outer surface, or, in other words, to shave off a layer of the entire sole and frog in every case where possible, and in this way the surface of the foot is cleared of all filth and dirt before the wound is explored at all. Then with a very sharp hoof knife we can follow the course of the wound through the horny layers, and if, on passing through the non-sensitive sole, we find it separated from the sensitive laminae and loose, I do not hesitate to remove all that portion which is undermined. This sometimes means the entire removal of the horny non-sensitive frog or perhaps half the sole, but if it is detached from the keratophyllus tissue to any great extent, I have found that the puncture has seldom penetrated any deeper, and by freely removing all of the loose sole or frog, we may, in most cases, look for a prompt and favorable termination, for regeneration of the horny covering progresses with remarkable rapidity. Where, however, the puncture has gone deeper into the tissues and the os pedis, tendon sheaths, or pedal joint is involved, the condition at once assumes grave proportions and our prognosis should be guarded. A sufficient amount of the non-sensitive covering should be removed to allow us to reach the most deeply affected parts with probe and curette. Here restraint becomes a question of importance, and where a table is not available, I believe the results will well repay our efforts if we take sufficient time to cast the animal and cocainize the wounded member, as it enables us to do our work much more thoroughly and with a greater degree of asepsis and, I might add, with far less danger to ourselves and patient. The operating table, however, is unquestionably the best means of handling severe cases. For a dressing, I am partial to some of the iodin preparations. When

not much pus is present I sprinkle the wound with iodin crystals and get them into the wound as deeply as possible, then holding the wad of absorbent cotton in readiness to quickly cover the wound I add a few drops of spirits of turpentine. The resultant explosion drives the fumes and intense heat into every recess of the cavity, and this seems also to greatly hasten the growth of horny tissue. Where much pus formation exists, however, the above treatment appears to form a coating or scab over the wound and retards drainage, and I like instead an application of ether, iodin or glycerine and iodin. I prefer to then cover the wound and in fact the entire foot with oakum instead of cotton, hold this in place with a bandage and then encase the entire dressing and foot in a well-scalded wheat bran poultice. I like bran for several reasons. It is easily obtainable, easily and quickly prepared, stays moist for a long time and will soften up and cool out an inflamed and brittle hoof as quickly as anything I have ever used, and when removed it does not adhere to the hoof and leave a sticky mess as does flaxseed and other preparations. I usually take the end of a No. 100 sack, cut it shield shaped, which allows the corners to wrap snugly around the pastern, and when properly tied with strong cord it is very seldom that a dressing will not stay in place 24 to 48 hours or even longer. And right here let me add for the benefit of the younger members, (I am getting old myself), that nothing will please a client more than to see a practitioner skillfully apply a dressing to a horse's foot, for it is something that very few laymen, even the very good horsemen, can do properly. An occasional saturating of the entire dressing with a solution of some disinfectant is advised until a redressing is needed, which may be in 24 hours or longer depending, of course, on the case, and it is very seldom that I leave a puncture wound for a caretaker or teamster to dress unless it is well on the road to recovery.

When lameness has subsided sufficiently that the animal may resume work, if there is very much of an open wound remaining, a piece of sheet iron or galvanized iron is cut the size of the shoe and punctured for nails corresponding to the holes in the shoe and this is used under the shoe as a protection to the tender part against further injury from bruising. I carry a piece of such material, tin shears and nails, etc. in my car and often apply them after dressing a nail wound in the country, for as a rule it allows you to provide more perfect drainage and the protection given the

wound by the iron covering enables the horse to resume work a few days sooner. I will not dwell upon the severe nail pricks which puncture the navicular joint and necessitate resection of the tendon, etc., for even if I could throw any light on them, which I doubt, they are a subject of sufficient magnitude to prohibit their discussion in this short paper. The above treatment will also apply to corns, only, in shoeing, the wall and sole of the affected quarter should, of course, be cut away sufficiently to provide frog pressure and relieve the pressure over the affected area.

Calk wounds occur most frequently in winter when the shoes are equipped with sharp calks and when the snow is deep. By far the greatest number of these are located around the region of the coronet and vary in severity from simple bruises to the opening of the coronary joint with resultant arthritis. The calk usually crowds down behind the wall or into the sensitive structure, infecting foreign material, as hair, dirt, etc., and lameness may develop at once, although as a rule lameness is most severe after an interval of three or four days, or when infection and inflammatory processes have progressed sufficiently to involve the surrounding structures. Hair should be clipped short and where the wall is loosened it should be carefully pared away with a very sharp knife until all filth and dirt can be reached and the horn below the point thinned with a rasp. Then, after thoroughly cleansing, if the wound is slight, an application of tar and oakum held in place by a bandage may suffice. But if the continuity of the skin or coronary band is badly broken, in which case lameness is usually severe, an application of ether iodin or glycerin and iodin and a liberal covering of absorbent cotton, held in place by bandages and kept thoroughly saturated with hot saline solution for two to five days without changing dressings, will in most cases be followed by a reduction in pain and lameness. I might also add that all paring of hoof around any wound should in my opinion be done by the veterinarian himself with clean, sharp instruments and should never be left for a blacksmith to do. I also believe it is mighty poor policy to send a horse to the shop with instructions to have a shoe fitted in some particular way without accompanying the horse to see that the shoe is applied as intended. I like to carry two hoof knives, one an ordinary blacksmith's knife to remove the outer surface and dirt and a fine double-edged knife for working around the wound and both should be kept sharp. Nothing will dissatisfy a client more quickly than

to see a veterinarian try to trim out a calk or nail wound with a rusty, dull knife, and the next case he is very apt to take to the blacksmith shop for treatment.

We all get our share of wire cuts and I shall have little to say about them except those which occur across the quarters where the wound is from above downward leaving a huge gaping wound with a flap hanging down. With these I have had exceptionally good results by taking a very sharp scalpel and, after washing thoroughly, shaving off a thin layer from both the flap and the side of the wound next to the foot. This seems to remove all infecting material and in reality makes a fresh wound. Then I draw the flap up holding it firmly there in an ample covering of absorbent cotton, keep it saturated with hot saline or antiseptic solution for four or five days without undressing and in most cases adhesion results when it is then treated openly. Even in some very angry and filthy wounds surprising results are obtained and only a small scar results. Where the lateral cartilage is severed, I try to remove the incised portion as it is next to impossible to obtain union between two segments of cartilage.

In speaking of laminitis, I will say a few words as I have nothing new in the line of treatment. I have not yet been able to find a specific and still use the old line of treatment, i. e., soaking in very hot and then very cold water, internally nitrate of potash, etc., and arecoline hypodermically. I have used the alum treatment in a few cases but so far have failed to see any decided benefit, certainly not enough to justify me in omitting the foot application which some writers have termed unnecessary. I do wish to say a word, though, about those cases of laminitis which result in a drop sole. These cases usually follow neglect on the part of the owner and seldom result when a case is treated in the early stages of laminitis. I shoe these cases always with a boiler plate or ball shoe or with a Corcoran shoe. Many of these hopeless cripples can be made serviceable by the application of one of the above-mentioned shoes. (Exhibit specimen). I remember one case in particular of a 1700 pound horse which was brought to a blacksmith for treatment. The smith wanted some advice before proceeding and I was called. The horse had had a severe attack of laminitis following an attack of acute indigestion for which he was treated by a quack. On examining the fore feet we found that the os pedis had dropped to such a degree that the soles were bleeding and the

horse had had great difficulty in coming in and wanted to lie down in the shop. We shod both fore feet with ball shoes and filled the cavity with hot tar and oakum. The horse walked home comfortably; the forefoot was placed in a weak solution of $CuSO_4$ for a couple of days. In three days the horse was ploughing and one week later I met the owner driving him on a brick pavement at a trot with scarcely any perceptible lameness. These were replaced when worn and in a couple months ordinary shoes were used.

Another case in a small mare used on a milk wagon had had a similar foot which had been treated by three different veterinarians for nearly a year. The owner was on the point of destroying her but decided to call one more man as there was a new one in town. We took her to the shop and a ball shoe was applied. She resumed work at once and in a few weeks her ordinary shoe was used and she is doing her work today and shows no lameness. I never got any pay for this job. This shoe is also very useful in incurable ringbone, and it is surprising how little they slip on an ordinary road or pavement. They do not hold so well on snow.

In closing I will say that in practically every case of a wound where there is a possibility of tetanic infection I administered a 500 unit dose of tetanus antitoxin.

VETERINARY CONDITIONS "OUT WEST"

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Many letters come to me from veterinarians in the east and middle west inquiring about the opportunities in the west. While our journals are full of scientific articles, research work and various other topics of a kindred nature, interesting to the profession in general, very few treat upon the subject of locations or business opportunities.

The young graduate often wonders what life holds in store for him, and unless he has the pull to land a good salaried position, he will not suffer from the gout the first or second years out of college.

The older man, located in a territory already over-run with practitioners, quacks, county agents, patent medicine vendors, tractors, jitneys and handy neighbors, looks around for better fields.

No matter how well a man may be equipped, mentally or physically, unless he has the business to do, he will not soon become a steady winter visitor to Palm Beach.

Then, there are many men who desire a change from a salaried position to that of private practice, or who are dissatisfied with the climate or other conditions in their present location. That the American nation is a nomadic one can be easily seen by spending a few hours in one of our great union stations.

The west has always been an attractive subject. The theatre has portrayed it as a country of unlimited opportunities. The "movies" have still furthered this idea, and the poor boy, leaving home with nothing but a mother's prayer and an extra pair of suspenders soon strikes it rich and they live happy ever after.

Some of my inquirers desire to go into the stock business. They have a few thousand dollars saved up and imagine they can soon treble or quadruple this wad. They forget the questions of range; wintering; marketing; diseases; poisons; predatory animals, and a thousand other obstacles. To dream of the warm sultry winters out in the northwest it is only necessary for me to state we have had over 115 days of sleighing, with over two feet of snow on the ground while I write this the first of March.

Let me take up some of the disadvantages first. First, one must get acquainted with clients. This requires time. The western people have had "hospitality" so worked on them they are getting somewhat chary of being so free with strangers. The rancher has had his fireside so often invaded by smiling real estate or mining stock salesmen that he looks long and carefully before he becomes friendly. His stock have been filled with bird shot by city hunters; his wire fences cut by unscrupulous fishermen and his pocketbook depleted by traveling bums of many and varied hue that it is not the free and easy west that was.

Then again, the old "vet. quack" has left a trail of anguish behind him. In my territory, one of these gentry made a call out in the country three miles, attempted to deliver a calf from a cow and killed both in the operation. He then operated upon the owner's war fund for thirty-five dollars. He ran bills wherever he could, and finally ran off with another man's wife, thereby suffering for some of the devilment he had been into.

The west is a land of big things. Ranches of many thousands of acres are common. Horses, cattle and sheep in bands or

herds of from one to ten thousand are not rare. When an animal gets sick it either dies or gets well without veterinary aid. The big ranchman is not a help to the veterinarian, and the only time the latter is called is when some contagious outbreak occurs. For this reason there may be only one veterinarian in a territory as large as the state of Delaware and still not be making over two thousand dollars per year.

Heretofore the low price of stock has been another factor against the veterinarian. In localities where pure bred stock are found many veterinarians are located. More graduates are coming out every year, while the non-graduates are becoming scarcer. In fact, the past five years in the west has not been very prosperous for the average veterinarian, and the graduate has profited more by the decrease in quacks or non-graduates than he has by increased stock.

State veterinary laws have not been held in very high repute. It is very seldom a conviction occurs, for if the defendant, no matter how guilty he is, can summon the required political pull, he usually gets off with such a little fine that he smiles. This condition is getting better each year, and conditions will be more ideal along this line a hundred years from now than they are at present. In all lines politics plays a large part and professional ability is very little appreciated.

The average income of the graduate veterinarian in the west runs from two to five thousand a year. Due to the enforced absence of booze in all forms, many of our brethren are saving a little money that formerly went to the distilleries or breweries. For the man who cannot do without booze, he will soon forget it should he move to Idaho, Washington or Oregon, where even the odor on one's breath is prima facie evidence of guilt.

A great many of the western ranchers are just getting a start in the world and are poor. Then again, others not so poor are even more tight. Collections are slow, many ranchers only paying once a year, while others cash up only every centennial. The cash customers are a delight to one's eyes but they are painfully few.

Living is very high in the west. Medicines are expensive, and automobile accessories out of sight. Gasoline was 27 cents last year, with prospects of Rockefeller donating more money to the Baptist Church, hence more raises. Tires are rather high also;

for example, the writer paid $48.00 per tire and casings for cord tires for a roadster. Medical supplies are in like proportion. House rent is exorbitant in many places; food is expensive and everything one has to buy is from two to ten times as much as back east. Many men with one or two children, living in their own homes, find that one hundred dollars per month does not go very far. The veterinarian has a good opportunity of buying advantageously, but even this does not reduce expenses much.

The climate is very good. Out here we do not know what it is to have to sleep out in the back yard in the summer with nothing on but a smile. As soon as the sun goes down a sweater or coat is welcome. The winters are often long, but the cold does not get so intense or full of pneumonia as back east. Then the cold is a different one than back east; ten below in a high altitude does not penetrate one near so much as ten above back in the middle west. But climate is a very ticklish question to tackle out west. Twenty miles make a difference of often a month in early spring. The sheltered river valleys may have grass growing in February; ewes are lambing; gardens are being planted, while ten or twenty miles away, upon the foothills of the mountains, lie three feet of snow.

What are the opportunities for veterinarians out west? Answering this, one can say about the same as back east. One will find the same drawbacks and same advantages. One will breathe more freely out here; he will soon absorb a western atmosphere that makes him forget the east. He will often improve in health; he may even make a little money. But the average veterinarian, with very little capital, should think hard and long before coming out here. If his resources are at all limited and he is making a fair living where he is, he had better think twice. If he has a large family it will pay him to think several times more. Out here it is a survival of the fittest. Whether one wears broadcloth or overalls, he is thought just as much of if he pays his bills. Family names have no significance; just because you belong to the leading clan in your home town in Punk City, Vermont, don't fondly imagine the denizens of Bunchgrass, Idaho, will respect you any more for it.

The west is full of college graduates. Don't think for a minute the whiskered rancher you meet is uneducated; he may be from a better college than you are. The miner, the stockman, the homesteaders and all of us in our varied pursuits of life, may be just as chock full of erudition as you are.

No better advice could I give to prospective westerners than to come out and view the country before shipping your furniture out here. Don't loaf around a chamber of commerce and talk with no one but the enthusiastic secretary whose job depends on how many suckers he hands out western blue sky visions to. Don't inhale all the beautiful dreams the real estate man hands you on the boundless opportunities open to all. Let him draw a long breath and he will confide to you that he has the best little ranch in seven states to give away to some honest, good looking man like you, and that in five years the people will be running you for governor or dog catcher. Talk with some old grizzled pioneer, or with some wideawake veterinarian who has been here some time, and you will soon learn that twenty dollar gold pieces don't grow on sage bushes.

PARASITES OF THE DOG IN MICHIGAN*

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While the parasites of the dog are of general interest, they are of particular interest to the veterinarian. The dog is one of the animals which come to our attention as patients, and parasitic infestations constitute a number of the complaints we are called on to treat. In our scientific work they serve as admirable experiment animals, and their response to treatment is so similar to the human response that our findings in regard to dogs are very readily applied to similar conditions in man; the dog has a digestive tract, food habits, responses to drugs and emotional responses very similar in most respects to those in man. Finally, dogs have certain good and certain bad qualities which concern us as individuals. Their good qualities make them valuable as companions, hunters, sheep dogs, watch dogs, etc. Their bad qualities make them objects of suspicion or condemnation as sheep killers, as destroyers of flower beds, as defilers of streets, sidewalks, and even food stuffs, and as carriers of parasites and disease.

That the dog is of real importance as a carrier of parasites and disease is something that is only beginning to be realized. Of

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late we have been centering our attention on the louse, the fly and the mosquito as carriers of disease, but we must realize, and doubtless will in time, that the fly's capacity for carrying trouble into the homes of careful and intelligent people is probably less than the capacity of the dog who leaves that home by day or night to wander in Heaven knows what filthy and germ-laden surroundings, to consort with other dogs, themselves diseased and from homes where there are diseased persons and diseased animals, and finally to come home to cuddle up on the foot of the children's bed, to take a nap on the couch pillows, where presently the head of the dog's master or mistress or child playmate will rest, or to thrust his nose into a welcoming hand or a friendly face to receive or bestow caresses. We have learned to welcome the fly with a swatter; perhaps we will learn to welcome our pet dog, after he has been out for a day's hike or a night's debauch, by prompt immersion in a bath of adequate germicidal and insecticidal character. The rat and the rat-flea, the combination that keeps the human race in danger and dread of bubonic plague, are being met with rat-proof buildings, rat-killing campaigns, and rat guards and fumigation for ships, and legislators are making liberal appropriations to carry out these measures. Fortunately, this campaign meets with no opposition from any body of persons claiming to be lovers of rats. Unfortunately, the campaign to put the vagrant, worthless cur and the carrier of rabies in the same category as the typhoid fly and the plague-bearing rats, meets with a considerable opposition from persons who love good dogs, poets who write verses to the constancy of the yellow cur, and zoophiles who would sacrifice the welfare of the human race to conserve the supposed welfare of the lower animals.

How general is the growing interest in the dog as a carrier of disease may be judged from a few facts:

The British Medical Journal of July 15, 1916, had an editorial entitled "In Dirty Dogdom," which says in part: "The French Council of Hygiene devoted the greater part of its last session to the consideration of the public dangers associated with the inordinate keeping of dogs and the insufficient control exercised over them. In the first place, the Council, having discussed at length the * * * recrudescence of rabies * * * determined to require that the measures for holding the disease in check should be most strictly applied. Next, Professor Raphael Blanchard undertook to prepare a report on the dangers of dis-

semination of hydatid disease by dogs and the preventive means which should be taken. Finally, the Council adopted a resolution urging that the regulations with regard to the municipal taxes on dogs should be vigorously applied.

At about the same time, the Medical Council of the British Science Guild was adopting a resolution condemning the pollution of the streets of London and of most cities and big towns by dogs, and suggesting to the government and municipalities that the evil might be reduced by increasing the tax on dogs and enforcing by-laws * * * In towns the tax on dogs should be doubled, and a large progressive increase imposed on each additional dog. The proposal will probably have the cordial support of the majority of retail traders, who daily suffer loss owing to the primitive habits of the little darlings that the women drag about with them."

In this country the U. S. Department of Agriculture has issued a bulletin (Hall, 1915) dealing with the dog as a carrier of parasites and disease, and the sentiment of that bulletin, to the effect that dogs should be given reasonable care and supervision by their owners, or destroyed if they have no owners, has been editorially approved by the Journal of the American Medical Association and a number of other medical and non-medical publications. Similar papers, asking for a reasonable control of dogs have appeared in various places, and among the latest papers of the sort is one in Public Health, published by the Michigan State Board of Health, for January, 1917, under the heading "When the dog becomes a nuisance." In the paper just mentioned, the author (Bush, 1917) says "Practically every dog is loaded with intestinal worms." Which brings us, finally, to our immediate topic, the parasites of the dog in Michigan.

What parasites of the dog are found in Michigan and to what extent are they present? These questions I expect to answer, so far as possible, principally from post mortem examinations of 74 dogs from the Detroit city pound, covering the period from October 1, 1916, to February 3, 1917. I have made only a hasty examination of the literature along this line and find very little published covering the subject for the State of Michigan. While the parasites of dogs in Detroit for the season mentioned will give a fair idea of conditions in general, it must be borne in mind that there will be certain differences between city dogs and country

dogs, and differences may be expected in degree or kind of infestations for summer and winter, north and south Michigan, and nearness to or remoteness from bodies of water.

Before taking up a consideration of the internal parasites of the dog, just a word in regard to the external parasites. There has been very little time for investigation of this sort, but, on casual observations of a few dogs, we have found one heavily infested with lice, both the biting louse, *Trichodectes latus*, and the sucking louse, *Linognathus piliferus* (*Haematopinus piliferus*), being present, the biting lice being much the more numerous. Osborn (1896) says of the sucking louse: "We have examined many dogs in quest of it, but only a single specimen so far has been our reward". Herms (1915), on the other hand, says: "Although other observers have found the sucking dog louse, *H. piliferus* Burm., less common than the biting dog louse, the writer has found this species quite as common in California, if not relatively more abundant". Prof. Pettit, Entomologist at the Michigan Agricultural College, tells me that he has not found lice at all common on dogs in Michigan, the biting louse being seen more often than the sucking louse. We found one dog plentifully infested with the common dog flea, *Ctenocephalus canis*, and doubtless this flea is plentiful on dogs in Michigan as it is in most places. We did not find any ticks on dogs, nor any records of the sort, though Hooker, Bishopp, and Wood (1912) published a map of the United States on which Michigan is shown as within probable range of the common American dog tick, *Dermacentor variabilis*. Prof. Pettit states that hunters in Michigan have told him that they had found ticks on their dogs in this state, but no specimens have come in and the species is, therefore, uncertain. The demodectic mange mite, *Demodex folliculorum* var. *canis*, occurs in Michigan, as numerous cases of demodectic mange, reported to me verbally by Dr. Ferry and Mr. Rowe at Detroit, and by Dr. Ward Giltner and Prof. Pettit at Lansing, testify. Sarcoptic mange, due to *Sarcoptes scabiei* var. *canis*, probably occurs in Michigan as elsewhere, but I have not yet seen any cases or found any reports of this.

Regarding the internal parasites of the dogs examined, a few figures may be given. Of 102 dogs that came into our hands, 28 were rejected for experiment purposes on the strength of a negative fecal examination indicating that these dogs were not infested. This does not necessarily prove that these dogs had no intestinal

parasites. Worm eggs are not always present in the feces even when worms are present in the intestines, for the worms may be too immature to pass eggs, or they may be all males, (a condition I have seen a number of times) or the females may be so few (and we have several times seen a single female of a given species present) that the eggs are very scarce and are not found, or egg production may be inhibited by a number of possible conditions. Dogs with negative fecal examinations were occasionally accepted for experiments where infestation was unnecessary, and were later found to have light infestations. Of the 74 dogs examined postmortem, 67, or 91 per cent were found to have internal parasites. In other words, 67 dogs out of 102 or about 66 per cent, were certainly infested, and since some of the rejected 28 dogs would be found to have some internal parasites if examined postmortem, we can feel sure that, on an average, more than two out of three Michigan dogs are infested with internal parasites, so far as dogs from the Detroit city pound are indicative of conditions. On this point it might be said that the pound dogs are fairly representative. These dogs represent almost all breeds except the toy varieties, though of course nearly all of them are mongrel or at least not pure bred. Our records show the following: Mongrels, terriers, rat-terriers, collies, English bull dogs, hounds, poodles, bull-terriers, mastiffs, spaniels, cocker spaniels, dachshunds and mongrels of all these breeds.

Of the 67 infested dogs, 2 dogs, or 3 per cent, were infested with coccidia. So far, the forms I have examined, apparently the oocysts, have not been sufficiently developed to warrant even a tentative determination, but the large size, 36 to 40 μ long by 28 to 32 μ wide, precludes the idea that this is the form described from the dog in Europe by Stiles under the name of *Coccidium bigeminum* (*Diplospora bigeminum*), since the latter species and its varieties seem to attain a size less than half of this, so far as literature is available to me. Regarding the pathogenicity of these coccidia I can say little. One dog died 5 days after coming into our possession. This dog's liver was light colored, apparently due to some degeneration, but showed nothing suggestive of the condition present in hepatic coccidiosis of rabbits. The immediate cause of death was an intussusception of the ileum into the colon by way of the ileo-cecal valve, with a resultant hemorrhage that filled the cecum and colon with blood. Various coccidial stages were found in

scrapings of the mucosa of the small intestine. The other dog showed a temperature of 101° to 101.5° and was bright and active for six days; the next day the temperature was 102.5°, the next, 98.8°, the next, 95°, falling to 94.5°; the next day the dog was found dead. The liver showed no evidence of coccidiosis, and the coccidian is evidently an intestinal form, so far as our evidence goes. This dog had been under experimental treatment to test the efficacy of treatments designated to kill the coccidia. The number of coccidia present in the feces did not appreciably diminish during the short period of treatment, but it appears from the gastro-enteritis found on postmortem that the treatment or the combined effect of the treatment and the coccidiosis killed the dog.

Of the tapeworms found in the dog at Detroit, the most common are species of *Dipylidium*. Of the 67 infested dogs, 31, or 46 per cent were infested with *Dipylidium*, the worms being present in numbers from 1 to 205. One of these species is the form commonly reported, *Dipylidium caninum*. The other is *Dipylidium sexcoronatum*. This latter species has never been reported from the United States before. In Detroit, it seems to be more common than *D. caninum*. I have also found it in the dog at Bethesda, Md., near Washington, D. C. I venture to surmise that a careful examination of specimens of the double-pored tapeworm from dogs, commonly reported as *D. caninum*, will show a large proportion to be *D. sexcoronatum*.

It might be noted that *Dipylidium caninum* has been reported as a parasite of man about 80 times, 3 of the records being American. In one of these cases, reported by Stiles (1903), the worm was passed by a 16 months old child in Detroit.

Joyeux (1916) has recently demonstrated that fleas, *Ctenocephalus canis and Pulex irritans*, become infested with the intermediate stage of *Dipylidium* while in the larval stage, the adult flea being unable to ingest the egg of *Dipylidium*.

Of the 67 infested dogs, 4 dogs, or 6 per cent, were infested with tapeworms of the genus *Taenia*. In two cases there was 1 specimen of *Taenia hydatigena* (*T. marginata*) present, indicating that the dogs had fed on offal of sheep, cattle or swine infested with *Cysticercus tenuicollis*, the thin-necked bladder-worm commonly found in the omentum and mesenteries of these animals. In the other two cases there were, respectively, 1 specimen and 3 specimens of *Taenia pisiformis* (*T. serrata*), indicating that the

dogs had fed on offal of rabbits infested with *Cysticercus pisiformis*, the bladder-worm commonly found in the body cavity of rabbits. Prof. Pettit has specimens of this parasite collected from the cottontail rabbit, probably *Sylvilagus floridanus mearnsii*, around Lansing, and I have seen the same parasite in the cottontail, probably the same species, purchased in the market at Windsor, Canada, opposite Detroit. This bladder-worm and its tapeworm are probably common in Michigan as they are in most places. I noted (Hall, 1910) in a paper on the genus *Multiceps* (the tapeworms having a coenurus, a thin walled bladder-worm with numerous heads instead of one, for an intermediate stage) that there was in the collection of the Bureau of Animal Industry, at Washington, D. C., a specimen of *Multiceps serialis* collected from the rabbit in Michigan in 1904. This is the species which occurs as a coenurus in the connective tissue of the rabbit and other rodents, sometimes forming large swellings under the skin. The corresponding tapeworm occurs in the dog, and it is probable that this species occurs in the dog in Michigan.

Regarding the presence of other dog tapeworms in the state of Michigan, I have no positive information, but there are some surmises that may be made.

The gid tapeworm, *Multiceps multiceps* (*Taenia coenurus*) has never been recorded from Michigan. The larval stage, or coenurus, of this worm was reported from Michigan in the American Shepherd's Bulletin in 1903, the veterinary editor diagnosing a case in two important rams on the very characteristic symptoms given by a correspondent. Everything indicates that the disease was imported and that Michigan has been and is free from gid.

Dr. Shafter of the U. S. Bureau of Animal Industry at Detroit tells me that hydatids, the thick-walled echinococcus cysts, are occasionally found in meat inspection of swine which may be of Michigan origin. Should these hydatids be found to occur in Michigan hogs, it would indicate that the corresponding tapeworms giving rise to this very important larval tapeworm is present in Michigan.

The broad tapeworm, *Diphyllobothrium latum* (*Dibothriocephalus latus*),which is a parasite of dogs as well as of man, has been reported from man in Michigan by Haglestam (1896). His case occurred in a native of Finland and was probably imported. However, this parasite has been found in persons who have never

been outside of the United States, and Nickerson has found the larvae of this worm in fish caught in the Great Lakes. It is, therefore, quite possible that this tapeworm may be found, sooner or later, in Michigan dogs.

As regards the flukes in Michigan dogs, I do not find any records. However, the lung fluke, *Paragonimus kellicotti*, which occurs in dogs, cats and hogs in the United States, has been reported, under the name of *Distoma westermanni* (*Paragonimus westermanni*), from the cat in Michigan by Ward (1894). It is quite likely that this fluke occurs at times in Michigan dogs.

Among the nematode parasites of the dog in Michigan, the commonest is the ascarid. Of our 67 infested dogs, 47, or 70 per cent were infested with from 1 to 100 ascarids. In other words, of 102 dogs, 47, or 46 per cent, were infested with ascarids on the basis of postmortem examination of fecal examination. Allowing for the limitations of fecal examination, it may be confidently asserted that half of the dogs in Michigan are infested with ascarids, if the Detroit figures are indicative of conditions, as they probably are. This is a higher figure than I find reported for Denmark, Iceland, Australia, Germany, or elsewhere in this country.

All of the worms that I have examined have been *Belascaris marginata* which is also the common form at Washington, D. C. The other species, *Toxascaris limbata*, is apparently the less common form in this country. These worms are normally parasitic in the small intestines, but are occasionally found in the stomach, a condition which commonly leads to their being vomited. They are an important pest of dogs, and are often held responsible for fits in pups. It is quite likely that they are often responsible, as these large active worms in the intestines give rise to considerable irritation and at times quite surprising reflexes. Ascarid worms are notorious for their wandering habits, often entering the bile duct, pancreatic duct, cecum, and stomach, and occasionally coming up the esophagus, and down the trachea, or into the eustachian tube. These conditions, commonly reported for man and for hogs, are apparently rare in dogs, and I have never seen the ascarid outside of the stomach or small intestines, except when passing out via the large intestine. One of these ascarids, *Toxascaris limbata*, has been reported a number of times from man, due to too friendly intimacy between man and dog and disregard of hygienic precautions.

Galli-Valerio (1915) says that he has confirmed the work of Dorbernecker in finding evidence of blood in ascarids, the blood being demonstrated by spectroscopic methods. He regards this as evidence that ascarids are blood suckers. This is not wholly conclusive. According to Garin, ascarids feed on epithelial cells, and the evidence of common observation and of the morphology of the ascarid's mouth should absolve it from the claim that it is a blood sucker in the ordinary sense of the word. Recently an ascarid which I collected from the feces of a dog showed a pronounced red color in the intestine, evidently due to blood. But a postmortem examination of the dog the same day showed the presence of a severe hemorrhagic enteritis. This was evidently the explanation for the blood in the ascarid in this case. Something of the same sort may have been the explanation in the cases of Dorbernecker and Galli-Valerio. In other words, ascarids will doubtless ingest blood as well as epithelial cells or other things, without being true blood suckers. The ascarids may occasionally lacerate the intestinal mucosa, and we know that ascarids occasionally perforate the intestinal wall, and in so doing it is likely that they ingest some blood. But this must be regarded as exceptional; and before regarding the ascarid as a blood sucker, it should be demonstrated that ascarids in general show the presence of host blood.

In another paper (Hall, 1917) I have recorded some experiments on the longevity of ascarids outside of the body of the host. Wharton (1915) kept the ascarids of man, *Ascaris lumbricoides,* alive in Kronecker's solution (normal salt solution to which 0.06 gram of sodium hydroxide per liter is added) for 6 to 12 days. At Detroit we have kept dog ascarids, *Belascaris marginata,* alive in this solution for 14 days. The ascarid of the pig, *Ascaris suum,* I have kept alive in Kronecker's solution for 26 days, and in normal salt solution for 15 days. In the paper mentioned, I have pointed out the bearing of these facts on the action of anthelmintics. It is believed by many veterinarians, physicians and laymen that when a worm-infested patient is fasted for 12 to 24 hours, the worms become hungry and will eagerly ingest an anthelmintic, especially if administered in what is regarded as a palatable vehicle. It will be evident that a worm that can live 2 or 3 weeks or longer on such an innutritious diet as Kronecker's solution, will suffer little for 12 hours spent in feeding on its customary diet, the epithelial cells, in the warm intestinal tract of its host.

Of course, the fasting preliminary to anthelmintic treatment is valuable since it removes much of the bulky food mass that might protect the worm.

Next in number of infestations to the ascarids are the whipworms, in numbers from 1 to 33. They are the whiplike worms which occur in the cecum usually, with the slender anterior end sewed into the mucosa. It has been supposed that the penetration of this unarmed head into the mucosa is effected by the solvent action of some secretion. Its pathological importance in dogs does not appear to be very great as a rule.

The next most common parasite in our series of dogs was the hook-worm, *Ancylostoma caninum*. This was present in 23 of our 67 infested dogs, or in 34 per cent. There were from 1 to 70 present. I have never yet seen a specimen of the other dog hookworm, *Uncinaria stenocephala*, nor were there any specimens in the extensive collection of the U. S. Bureau of Animal Industry at Washington, but Muldoon (1916) reports both hookworms as present at the clinic of the College of Veterinary Medicine at Ithaca, N. Y.

So far I have seen no hookworm infestations in Michigan dogs which were as heavy as those in Washington, D. C. The heaviest infestation seen in Detroit totalled 70 hookworms, and this infestation in a puppy had given rise to a clinical case of hookworm disease. In Washington, Mr. W. D. Foster and I found infestations with 104, 233, 242, and 812 hookworms. This is what might be expected. The development of hookworm eggs outside of the host animal to the infective stage depends largely on the factors of warmth and moisture. There is an abundance of moisture in Michigan, as there is in the District of Columbia, but the lower temperatures in Michigan are less favorable to hookworm development than are the higher temperatures of the District. In the southern United States conditions are even more favorable to hookworm infestation, and in some localities breeders find it difficult to raise pups on account of the mortality from this disease.

Of the nematode parasites of the dog, one which does not occur in the digestive tract has lately received some little attention in print. This is *Dioctophyme renale* (*Eustrongylus gigas*), the giant kidney worm of the dog. This worm is the largest of all the true nematodes, the female attaining a length of about one meter and a thickness of over a centimeter. The worm is blood red and

very striking in appearance. It is usually reported from the kidney or from the body cavity, rarely from other locations. Riley (1916) recently summarized the cases from the United States and Canada, a total of 27 cases, the worms being in the body cavity in 12 cases or 44 per cent. From Riley's paper it appears that cases have been reported from Charleston, S. C., Georgetown, S. C., Washington, D. C., Baltimore, Md., Pittsburgh, Pa., Philadelphia (?) Pa., Ithaca, N. Y., Albany, N. Y., New York City, N. Y., Kingston, Ont., Toronto, Ont., Columbus, O., and Winnipeg, Manitoba. A case which Leidy reports, on the authority of Mr. Joseph Jones, of Georgia, of the occurrence of the worm in the heart of a dog, has been generally discredited by parasitologists, though Riley is inclined to accept it. Personally, I feel that there was more likelihood of mistaking a blood clot for this worm, and a mistake of this sort is known to have been made, than that such an unusual thing should be true. In this connection I wish to mention a trifling error, which by some inadvertence, has crept into the paper by Riley and Chandler (1916), reporting one case of this parasite. In their plate I, the figure of the worm is stated to be reduced one-fourth. As the figure is 37.5 cm. (almost 15 inches) long and .9 cm. (about 3/8 inch) thick, this would make the worm 1.5 meters (5 feet) long and 3.6 cm. (1½ inches) thick.

As I noted that Riley's records did not include two published cases of which I had records, I published a note (Hall, 1916) reporting these cases and adding a new case. One of the published cases was from Baltimore, Md., and the other, as a later note by Kaupp (1916) makes clear, from Chicago, Ill. The new case was from Ann Arbor, Mich., and is the first record of this parasite from Michigan. To that record I wish to add at this time. Two of our 67 infested dogs from the Detroit pound, or 3 per cent, were infested with *Dioctophyme renale*. In one case the worm was a female, 36⅜ inches (91.7 cm.) long by 5/16 inch (8 mm.) thick. The head was near the gall bladder, the worm extending forward between the lobes of the liver on the right side, then forming a large coil between the liver and diaphragm, then between the liver and diaphragm to the left side and along the body wall, then in to the intestines, the tail lying under the omentum. In the other case there were two male worms present in the abdominal cavity, one lying between the body wall and the liver and intestines on the right side, the other involved in the gastro-hepatic omentum. In

both dogs the great omentum was inflamed. This is a common lesion in infestation with this worm, and presumably results from the protective activity of the omentum in guarding the host animal from the excretions and secretions of the parasite. Dr. Brenton tells me that he has seen about a half dozen cases of the occurrence of this worm in dogs in Detroit, the worm being in the body cavity in all cases. My own records added to Riley's show a total of 32 cases from the United States and Canada, 3 of these cases being from Michigan. Of the 32 cases the worm was found in the abdominal cavity in at least 16 cases, or 50 per cent. With Dr. Brenton's cases we have about 38 cases from the United States and Canada, with over half of the records reporting this giant kidney worm from the abdominal cavity.

(Since the above was written, a later paper by Riley (1917) has come to hand. In this paper Riley records one additional case from Chicago, and notes an indefinite number of cases at the same place. It appears, therefore, that the worm has been found at least 40 or 50 times in the United States. Riley discusses the theory, first suggested by Stratton in 1843, that infestation of the peritoneal cavity might occur by way of the Fallopian tubes in bitches. In the American records, 7 of 8 peritoneal infestations, where the sex is given, were in females. In both of my cases the animals were females, making a total of 9 cases out of 10, or 90 per cent of cases in females for American cases where the sex is known.)

It is rather surprising to note that in our series of necropsies cases of infestation with *D. renale* were as numerous as cases of infestation with coccidia or even with the very common *Taenia hydatigena* or *T. pisiformis*. It is surmised that *D. renale* has an intermediate stage in fish, since it occurs in the seal, otter, mink, etc. If this is true, it may account in some degree for the surprising frequence of these worms in Detroit.

A comparison of the figures for the 67 infested dogs examined by Mr. Drake and myself in Detroit with those for 76 infested dogs examined by Mr. Foster and myself at Washington, indicates that in general worm infestations are slightly more numerous and heavier in Washington. Thus 51 per cent of Washington dogs have *Dipylidium* in number from 1 to 1500; 8 per cent have *Taenia* in number from 1 to 2; 57 per cent have whipworms in number from 1 to 331; 71 per cent have hookworms in number from 1 to 812. On the other hand, 70 per cent of Detroit dogs have ascarids,

while a slightly smaller proportion, 67 per cent, of Washington dogs are so infested, and 3 per cent of our series at Detroit had *Dioctophyme,* while we found it in none of the larger series at Washington. At an earlier period in Washington, Sommer (1896) found *Taenia* in 14 per cent; *Dipylidium* in 44 per cent; ascarids in 28 per cent; hookworms in 56 per cent; whipworms in 70 per cent; and *Dioctophyme* in 2 per cent. It would appear from this that Washington dogs have more hookworms and whipworms, while Michigan dogs have more ascarids. The above figures cannot be compared exactly for the reason that we had rejected some dogs on negative fecal examinations.

Dogs in Lincoln, Nebraska, according to Ward (1897), have few hookworms and ascarids, and many tapeworms. In Colorado Springs, Colo., I found hookworm infestations quite uncommon, doubtless due to the combination of bright sunshine and dry air and the low temperature at night.

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THE NECESSITY FOR ADEQUATE MEAT INSPECTION LAWS FOR THE RURAL DISTRICTS*

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Vitally essential to the Public Health interest of our state, is the enactment of an adequate Meat Inspection Law. It is imperative that such an act be placed upon the statute books of New York State. The economic interests of the state require this. It has been shown by experience in other lines, that a larger and more profitable business can be done when such business is properly conducted and systematically regulated. The livestock interests of our state have suffered because of the lack of proper jurisdiction, and the Public Health interests of our rural districts have suffered from this same lack of supervision and care; those who live in the rural districts do not share, to so great an extent, the benefits which come from federal and municipal inspection, as do those who reside in or near the cities, protected by such laws.

There is no measure which could be enacted, which would aid to such a great extent in detecting and controlling infectious dis-

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eases of animals as a good meat inspection law. By its aid epizootics could be averted, for it would give a positive clue to the point of origin of a disease and its spread could be immediately checked without the enormous expenditures which are often necessary to stamp out an infectious disease after it has become widespread. From an ethical standpoint alone, it behooves us to enact such a law, because it would enforce cleanliness and sanitary habits upon a class of people who handle and prepare the food we eat, and who are ofttimes remiss in such matters where it involves an expenditure. Too much stress cannot be laid upon this particular point, for the violations are extreme in many instances. Conditions under which animals are sometimes slaughtered and dressed are so revolting that a person of refinement would sicken at the thought of having to eat food prepared in such an unwholesome manner. To emphasize the need of local inspection, let me quote from Dr. A. D. Melvin's Report of the Bureau of Animal Industry,—"Uninspected slaughterhouses as a rule, have many features that are not only objectionable, but dangerous to health. The smell of the country slaughterhouse is proverbial, and the conditions at some of the places are inexpressibly foul and filthy. They are usually located in some out-of-the-way place, and sometimes outside the corporate limits, often surrounded by stables, or even being a part of a building which is also used as a stable, barn, or for some such purpose. Sometimes they are located on the banks of small streams and pollute the water. Such places are often the means of spreading disease. It is frequently the custom to feed offal to hogs or to throw it where dogs, hogs, and rats *have access to it*. By this means trichinae, tapeworms, and other animal parasites are disseminated, some of which are dangerous to man. Hog cholera, tuberculosis, and other contagious diseases may also be spread by such conditions. Usually there is no protection to the meat against rats, flies, and other insects and vermin, and this condition constitutes a dangerous source of contamination and infection."

For our legislators to ignore the need of remedial measures *is criminal*. The best laws are none too good where health is at stake, and just here I want to quote the motto upon the letterhead of the New York State Department of Health, viz: "Public health is purchasable. Within natural limitations any community can determine its own death rate!" I earnestly implore this associa-

tion as a body of trained specialists in animal diseases, sanitation and hygiene, to use its great influence in having enacted proper laws to safeguard the health of those people of the state who at present derive no benefit from the federal or municipal inspections. According to statistics these people comprise about 21% of the entire population of the state. They surely are entitled to some consideration. Let us urge our law makers to "purchase a little public health", it will prove a paying investment.

The United States Government in 1916 spent over $3,000,000, and will spend in 1917, $3,600,000 for meat inspection.

As a result of our thorough *federal* meat-inspection methods our export trade has improved, and foreign countries, which at one time rejected our meats and meat products, now unhesitatingly accept them with full confidence in their purity and freedom from contamination.

The present federal law requires an ante-mortem as well as a post-mortem examination of animals, and it has been stated that it is the custom of many of the owners of slaughterhouses under federal inspection, where large numbers of animals are handled, to engage men, skilled in meat-inspection, to examine all animals and segregate those which they doubt will pass the federal inspectors, and reship them to other points where no inspection is required.

Let us "put up the bars", and protect ourselves from any such possible imposition, by enacting suitable laws; laws which shall cover the conditions and surrounding of all animals slaughtered for food, at the time of slaughter, and through all the processes of preparing the same for food uses, viz:—smoking, canning, curing, and preserving in any way.

Let us inaugurate a systematic campaign of education in the matter of making the meat-food supply for home consumption from every part of our state, from the remotest farms, as well as the largest city, just as surely a healthy, sanitary product, as that which we must produce for export from the state, under the present federal laws. Let us show the people, first, just what they get in "uninspected" meat, and meat products; through ignorance sometimes, but generally through criminal negligence and inattention to the first, most simple and necessary, sanitary requirements. Let us place the matter as to conditions, simply and intelligently before the consumers. Let us make them force the producers to give them the best, and only the best. They must first

see and acknowledge this evil, before it can be fought and overcome, and it is only by well organized, concerted action that we can accomplish any good results.

In our large cities we have some protection, under the laws of the boards of health, but these laws are *not* far-reaching enough, and even in the outskirts of our largest cities, and uniformly in the smaller towns and all rural districts, slaughter of diseased and "suspicious" animals is permitted, uninspected, unmolested, unrebuked. This meat is placed on sale, and finds its way to your table and mine, perhaps. Could we but show the consumers the filthy, revolting, unsanitary conditions under which even healthy meat is slaughtered and prepared for their use they would not need to know that animals too badly diseased to pass the federal inspector, or boards of health inspectors in our cities, are passed on to local abattoirs and butcher-shops, where danger of inspection is nil, and this same meat is permitted by our lax laws to be placed on sale, to jeopardize the health of the ignorant and innocent. There is just as great a need to enforce sanitary conditions to govern the slaughter of food-producing animals, as there is to insure the killing of only such animals as are fit for food purposes. It is true that the average consumer can detect tainted or spoiled meat, but he could not be expected to determine that an animal had been affected with a contagious disease. This must be done, at the time of killing, by a competent and skilled veterinary inspector. We must have a law which will protect the consumer against his own ignorance.

Let me distinctly set forth:

1. That the federal government has no jurisdiction, whatsoever, over animals slaughtered, to be sold and consumed within the state.

2. That, in our rural districts, conditions not covered by federal inspection laws, are met with.

There are problems to be solved which call for a special jurisdiction. It is true, the object is the same in each instance, but the methods employed must be different. These must meet conditions as they exist.

Let me call your attention to the alarming extent of disease among animals offered for slaughter as evidenced by federal inspection statistics. Nearly 2% of all inspected carcasses are affected, in part or in whole. It is a well known fact that tubercu-

losis is more prevalent among dairy cattle than among animals which range in the open country. Statistics show that the large slaughterhouses under federal inspection, draw their supply of cattle principally from the great ranges of the West, and that the greater percentage of animals killed in local slaughterhouses and butcher-shops are obtained from dairies. We have only to deduct from this, that the majority of carcasses offered for sale through these sources, are thus affected.

The following diseases and conditions (under the federal inspection laws) make the meat of food-animals unfit for human consumption:—anthrax or charbon; rabies; blackleg; hemorrhagic septicemia; pyemia; septicemia; vaccinia; tetanus; malignant epizootic catarrh; hog cholera; swine plague; actinomycosis; caseous lymph-adenitis; tuberculosis; Texas fever; parasitic ictero-hematuria; tapeworm cysts; infections which may cause meat poisoning; uremia and sexual odors; icterus; urticaria; melanosis; tumors; bruises; abscesses; liver flukes, etc; emaciation and anemia; milk fever and R. R. sickness; pregnancy and parturition; immaturity; diseased parts; suffocation; dead animals; bruised parts.

The same regulations and careful culling out of dangerous meat-food products should be made to apply to all animals slaughtered within the state for home consumption. The state should inspect present conditions in local slaughterhouses, butcher-shops, outlying farms, wherever animals are slaughtered to be used for food. It should inspect and condemn; then suggest, and provide for the remedy. It should institute a careful supervision of the work of making perfectly sanitary, the conditions under which our meat and meat-products are prepared for use. It is impossible, and impracticable at this time to suggest in detail what must be done.

First and most essential, are the sanitary conditions. This means cleanliness, light and ventilation, water, dressing-room and toilet facilities. Disposal plants, for taking care of diseased carcasses, or parts of carcasses, offal, blood, etc., so that these will not be at any time exposed to flies, insects, dogs, rats, or other dangerous carriers of infection and disease. We must not forget that meat is one of the greatest carriers of pathogenic organisms, and that it readily decomposes when not properly taken care of. It must go further, and see that in the canning, curing and preserving of meat products no harmful chemicals and preservatives are used,

and, when all is ready for market it must insist on no false or misleading labeling of such products.

The law must take into consideration the location, construction and maintenance of properly constructed, thoroughly sanitary and convenient slaughterhouses or abattoirs, for local use; also, a competent system of inspection. This has been thoroughly tried out and found most effective and satisfactory in Europe, but we are slow in following a worthy example, in this important instance.

This system of inspection in rural districts has the tendency to make the local producer take greater care of the health of his animals. He must do this in order to "Pass Inspection", and this will greatly elevate the standard of health of our farm animals. If, on the condemnation of an animal, the producer is made to share the loss,—or if the law insists that animals sold for slaughter, must be in proper condition at the time of such sale, then we will find the producer anxious to have healthy animals, and willing to work to this end. As it is now, in rural districts we find cattle, too old and worn out to be used for dairy purposes, killed and sold for food. Animals which have never been tested; whose meat is not inspected. It is in these same districts that we will find our greatest difficulty in working out a plan for inspection which must be thorough, but inexpensive.

A centrally located abattoir, owned by the township, could be small, but perfectly fitted out for the purpose; expenses could be met by a small *per capita* fee:—and a trained veterinary inspector could be in charge, at certain times, on certain days, as business would warrant. In some sections one inspector could have charge of a number of these places, having stated times at each place. Our state is graduating practical meat inspectors every year. We spend vast sums fitting men to fill such positions, and then do not make use of the knowledge which they have acquired. We veterinarians can appreciate the fact that it is most desirable that the work of inspection should be done by veterinarians, who are skilled in recognizing the presence of disease in the animal, and are also aware of the harmful effect on man of the consumption of such diseased meats. We are scientifically trained not only to detect the presence of disease, but to know whether it is communicable to man and if so, under what conditions.

Typhoid fever has been caused from the pollution and contamination of meats by impure water, as instanced in the slaughter of animals on the banks of a stream, or in the proximity of wells and cisterns, where such water is used in washing the carcasses.

There are within our state, slaughterhouses where horse-meat is prepared and sold for human consumption, under most unsanitary conditions. Some of these places have been found to be so unwholesome, so absolutely filthy, that local health departments have exerted their authority and caused them to be closed. There are some still in operation, and under existing circumstances this meat can be sold for food.

We need immediate protection from unscrupulous producers and their agents. Too long have we been sitting supinely, *we, who are cognizant of facts.* We are *"our brother's keepers"*. Let us be up and doing. Let us of the Empire state set an example to our sister states which will be followed by all to their great advantage. Let us be the pioneers of this movement for state inspection, which shall be a credit to us; which shall conserve the health of our live-stock, the health of our people, and their ever increasing prosperity. We *can* do this. Shall we?

NAVEL ILL*

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After several years of study and a great deal of thought and investigation on the subject of navel ill, I have come to the conclusion that there is plenty that may be learned about this disease, especially along the lines of organisms which cause the disease; the mode of entrance into the body; how the organisms are distributed to the different parts of the body; the different types of the same disease; how best to treat the disease, preventive or medicinal.

The cause of navel ill: investigators believe that no one organism causes the disease, that as a rule several microorganisms have been isolated from the diseased joints and navel,—the *B. coli*, staphylococcus, streptococcus, *B. tetani*. Dr. Schofield, of the Ontario Veterinary College, claims to have isolated the *B. abortus*

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equinus in cases of naved ill where symptoms showed up within a few hours after birth, in areas where abortion was prevalent, and Dr. Mack of the University of Nevada claims to have isolated the *B. necrophorus,* in cases of navel ill in lambs on premises where sheep had foot rot.

The mode of entrance of the organisms into the body is of importance. Some authorities maintain that the germs causing navel ill gain entrance to the body at the time of, or soon after birth, before the navel dries, which seems to be the opinion of most practitioners and those who have done research work along that line. Reports of cases of navel ill where the colts were foaled in pastures in which there were no sheds or feed racks are comparatively few, and when such cases are reported, usually upon a thorough investigation it is found that the colts were dropped on the ground where stock congregated on account of annoyance by flies, thus developing a place for contamination equal to that of a barn yard or possibly the barn.

A Percheron colt, eligible to registration (which was the property of Mr. Kessler, of Iowa), was foaled in a pasture where there was not even a feed trough, but within seven days after birth the colt showed symptoms of navel ill and died within a few days after the symptoms first appeared. Upon investigation it was found that at the time of birth the colt was dropped into a small drain, which carried water from the barn yard during rainy weather, and there is no reason why the drain was not as badly contaminated as the barn yard itself. The colt evidently received the infection at that time, as a post mortem examination showed that the infection gained entrance through the navel.

It has been said by some investigators that navel ill was contracted intra-utero, and in some rare cases this statement seems to have some virtue, as in some cases it is said that the symptoms of navel ill are shown within a few hours after birth. It is said that in some of these cases there is shown on post mortem examination internal lesions of some of the internal abdominal organs, and swelling of some of the joints at time of birth. However, we must not lose sight of the fact that many colts at foaling have large joints on account of the loosely arranged structures, especially the ligaments and joint capsules, the capsules being filled with seemingly an abnormal amount of synovia.

It has not been the experience of the writer to observe a case which was even thought to be infected intra-utero. Intra-utero infection, if such a condition does exist, could only take place by the germs gaining entrance to the uterus, through the os uteri, or pass through the maternal system after gaining the capillaries of the mucous membrane of the uterus, the organisms then producing a suppurative area which may slough through and into the chorion of the placenta, where possibly the germs might gain entrance to the capillaries of the fetal circulation, and from there pass into the body of the fetus, but even then it seems very probable that abortion would follow.

In the years of 1913-14-15 a careful canvass of 85 farms was made in 14 different states where navel ill was prevalent, or had been prevalent for some time, and it was found that the number of foals reported for the three years on the 85 farms was 1616, or an average of 19 foals per farm. The number lost from navel ill within the three years was 133 head, or about 8 per cent. of the crop of colts for that time. Of the 85 farms, the owners of 25 farms were induced to clean the barns or stalls and some used disinfectants, and special care of the navel at birth was given, and from the 25 farms the loss last year was a little less than one per cent.

Dr. Mack, of the University of Nevada, reports umbilical necrobacillosis in lambs, on one ranch where 4000 ewes were wintered and sheared. In the spring following 5200 lambs were born. Twenty-two hundred lambs died and of this number 70 per cent., or 1540, died of navel ill. The premises were scraped, filled and cleaned, and no loss from navel ill resulted the following year.

It is conceded by Hutyra & Marek, Nocard, and I believe by Dr. Williams, of Cornell, that white scours in calves is frequently caused by the organisms gaining entrance through the broken end of the umbilical cord at the time of birth, or soon thereafter. Sanitation and isolation have so far reduced the usual number of cases on infected farms.

It is now believed that navel ill in pigs is very common, especially years that climatical conditions favor development of such organisms, or years that climatical conditions are less favorable for the resisting power of the young pigs. However, navel ill in pigs should not be confused with so-called articular rheumatism, arthritis.

The mode of distribution of the organisms within the body of the young depends altogether on what part of the broken end of the navel cord the organisms enter the body and what structure or structures are involved. In some cases of navel ill due to infection after birth, the organisms enter the umbilical vein and finally gain the general circulation, to become widely disseminated; in other cases the infection gains entrance through the urachus and thence to the bladder, and in many cases from there through the ureters to the kidneys; in rare cases infection takes place through the umbilical arteries, thence to the external iliac arteries, and on into the general circulation; in those cases of intra-utero infection the organisms must pass from a sloughing area of the uterus and chorion into the circulation of the placenta, and then, through the umbilical vein, and finally the general circulation of the fetus, which must take place near the time of parturition, or abortion will occur before the normal time of parturition.

Navel ill may be classified as to the nature of the disease developed, as—1st, septic arthritis; 2d, tetanus; 3d, pervious urachus, frequently accompanied by septic arthritis; 4th, where the visceral organs are involved, especially visceral necrobacillosis in lambs; 5th, white scours in calves.

Treatment has given more or less uncertain results, probably because of the lack of care of the young following birth, until the stump of the navel cord dries. Bacterins are used as a preventive with fair results. Best results have been obtained where sanitary measures were observed in combination with the use of navel ill bacterins.

As a preventive, bacterin should be given at least in two doses, one dose at time of birth, another within a week or ten days later, and where infection that causes navel ill is known to exist, the stump of the cord should be cared for by stripping off the coagulated mucus, (Wharton's Jelly) with the thumb and fingers and applying tincture of iodine, or some agent which has a tendency to dry the surface of the stump, as well as possessing antiseptic properties. Bacterin treatment of the dam before parturition is still in the experimental stage, but has been tried out to the satisfaction of the few veterinarians who have used the method and with them, bacterin treatment of the dam, has proven very satisfactory. This mode of treatment should be carried on

by giving one dose of bacterin thirty days before the time of parturition, a second dose two weeks later, and a third dose two or three days before parturition, followed by a dose of bacterin given to the young within five to seven days after birth.

Proper sanitation, cleansing the stables and stalls by disinfecting the same, has proved to be the most efficient mode of preventive treatment, and where sanitary regulations have been followed in combination with bacterin used as a preventive, the best results have been obtained.

Bacterin, or other treatments, after symptoms of navel ill have appeared, is not as effective as some reports have led us to believe and the mortality is much greater than from preventive treatment and sanitation.

Dr. Schofield, formerly of the University, Veterinary Department, Toronto, Canada, reports that out of 170 cases of navel ill in foals, treated with bacterin, 75 per cent. of the cases were saved, leaving a loss of 25 per cent., while the loss of foals without bacterin treatment runs as high as 90 per cent.

BLACKLEG FILTRATE

DR. A. EICHHORN
From the Lederle Antitoxin Laboratories, Pearl River, New York

For the prevention of disease there is no biological product used as extensively and which has become so well established as blackleg vaccine. The good results which followed its introduction are now being recognized throughout the United States and it may be safely stated that in blackleg districts a considerable proportion of animals are now being annually vaccinated with this product. The available statistical data proves the remarkable reduction of losses from the disease as the result of systematic vaccination.

The most common method of vaccination against blackleg which is being employed, not only in the United States, but also in other countries where blackleg is prevalent, consists of the injection of attenuated virus prepared in either pellet or powder form. The number of annual vaccinations with this product amount to many millions, and while the reports prove conclusively a marked reduction in the number of deaths following vaccina-

tion, nevertheless the results cannot be expected to be uniformly satisfactory, as direct losses from vaccination are known to occur from time to time; and, furthermore, insufficient protection following vaccination is also of common occurrence.

The vaccine prepared in pellet or powder form is the outcome of early investigations on blackleg immunization by Arloing, Corvin, and Thomas to whom the honor belongs of developing the method of immunization known as the "Lyon Method." The principle of this immunization consists in the attenuation of dried juices from blackleg lesions of an animal which has succumbed to the disease. The attenuated material is subjected to two different degrees of attenuation—one being exposed to a higher temperature and used for the first injection and the other attenuated at a lower temperature and used for the second injection. The injection is made into the dense tissue of the tail with the intention that the firmness of the tissue would prevent the rapid development of the reaction following the vaccination.

This method has been extensively employed throughout the world and the results might be considered highly satisfactory, although losses from vaccination and insufficient immunity have been observed from time to time. Furthermore, complications resulting from the injections, such as necrosis of the tail, etc., are not unusual.

Kitt in 1898, published the results of his experiments whereby he succeeded in simplifying the "Lyon Method"; his process requiring only a single injection, and he further recommended that it be made in the shoulder region where the skin is loose and easily pierced by the needle. For the preparation of the vaccine, Kitt utilized the affected muscle of the animal which was cut into strips, dried and pulverized in a drug-mill. The powder is then mixed with distilled water into a paste, filled into shallow pans and placed in the attenuating oven where it is subjected to a temperature of 95° for a period of six hours. The attenuated material is then ground into a powder which is prepared into either pellet or powder form (Government Vaccine).

In considering the method of preparation of the vaccine, it must be realized that the product is comparatively crude. Blackleg vaccine as marketed at the present time cannot be accurately standardized and a single dose may contain 100,000 or one million spores and at other times a much smaller number, if any. Such

a variation would naturally result in irregularities of the immunizing action of the vaccine, and it is no doubt due to this fact that direct losses from vaccination and from the natural infection after vaccination, cannot be entirely avoided.

The short-comings of the blackleg vaccine lie mainly in the fact that in its production the spore contents of the product cannot be accurately estimated. It is true that the vaccine is weighed or measured, but it is impossible to establish the amount of active virus which it contains. Not only is it impossible to determine the amount of living vegetative blackleg organisms and spores in the tissues used for the vaccine production, but it is also impossible to estimate how much of the active material will survive the attenuation. The variation of the amount of virus in the affected tissues of an animal is, no doubt, considerable and the effect of the attenuation upon the virus may also vary in the different lots used for the vaccine production. The former views—that the individual organisms of a culture or of an infected focus are biologically uniform—can be no longer substantiated; and likewise, there is no longer any doubt that the individual vegetative form or spores possess a varying susceptibility toward exposure to higher temperature. Accordingly, the reduction of the number of organisms following heating is not always uniform. Thus, it is impossible to determine whether the original material used for the vaccine production contained an insufficient number of organisms or spores, or to what extent they might have been injured or destroyed by the process of attenuation. There are no scientific methods known to overcome these deficiencies.

In order not to bring this method into disrepute, it would be essential to eliminate these short-comings. It is a recognized fact that in blackleg vaccination sufficient immunity is only obtained in case the spores contained in the vaccine have actually germinated in the animal. To develop a vaccine of a potency which would be capable of inducing only a very slight infection and at the same time to limit its action within safe borders, so that the infection does not become too severe or fatal, has not been attained by the present method.

A further technical deficiency in the preparation of the vaccine from blackleg meat and juices, consists in the irregular consistency of the vaccine powder and of the emulsion prepared therefrom. It is natural that the preparation of a homogeneous

solution from the powder is almost impossible and if the vaccine contains an insufficient number of broken up clumps, the results are naturally different than when a homogeneous emulsion is employed.

In view of the imperfection of the vaccine prepared from the affected parts of a blackleg carcass, investigators have directed their attention toward developing other methods of vaccination by which these deficiencies might be overcome.

Attention was then directed toward developing a vaccine consisting of the attenuated cultures of the blackleg organisms. Kitt, Detre, Poels and others, have employed blackleg cultures in which the organisms were attenuated in various ways for the immunization against blackleg. The results were not uniformly satisfactory. However, in various localities one or the other method has established itself and is now being used to some extent.

Later, Leclainche and Vallee developed a liquid blackleg vaccine which they tested out very extensively and it is now being employed in different countries with fairly good results. The short-comings of the liquid blackleg vaccine must be recognized since it is subject to the same deficiencies as is the Pasteur vaccine for anthrax, viz.—a careful standardization of the product is almost impossible; the keeping qualities of such a vaccine are limited; and furthermore, it is a recognized fact that the blackleg organism does not retain a uniform virulence upon artificial cultivation. These factors, no doubt, are responsible for the fact that the liquid blackleg vaccine is not attaining popularity for vaccination against blackleg.

With the advent of the development of the different immune sera for the prevention and treatment of diseases, the utilization of animals for the production of blackleg immune serum has also been undertaken. For this purpose, horses and cattle have been injected with cultures of blackleg, at first in small doses, which later are increased until as high as 500 c.c. are injected intravenously. Unfortunately, at the present time we have no means for an accurate standardization of such serum since it is a recognized fact that the laboratory animal tests are unsatisfactory for such purposes. The writer is now carrying out experiments by which the various products for blackleg may be more accurately standardized and the results along these lines are very promising.

In the case of the serum, the complement fixation or agglutination may yield the desired results whereas with the other products, especially with the germ-free extracts and filtrates, the toxicity will have to be given consideration in the standardization of the products.

It is natural that the use of the serum for the control of blackleg has its limitations. The injection of an animal with serum induces only a passive immunity which at best would protect the animal for a period of only one month. However, in herds where the disease has already caused considerable losses, the animals might be subjected to the serum treatment, to be followed later by an active immunization.

For curative purposes, blackleg serum is known to exert a very favorable action, but in this instance also it must be recognized that the disease runs a very rapid course and in most cases the administration of the serum would be rendered fruitless.

More recently in this country, germ-free extracts (aggressins) have been highly recommended for immunization against blackleg. The products are obtained from animals artificially affected with the disease and the affected muscle and fluids are extracted by pressure. The fluid thus obtained is frozen in order to facilitate the filtration of the liquid. After filtering and suitably preserving, it is marketed, about 5 c.c. constituting a protective dose for each animal. The results from vaccinations with this product are highly satisfactory and no doubt more reliable and uniform than with the blackleg pellets or with the powder. However, the cost for the production of such extracts is considerable and therefore the stock owner, especially since he is accustomed to expend only a nominal sum for the products used heretofore for vaccination against blackleg, would not readily take advantage of this product.

The immunizing action of the extract, no doubt, is dependent upon the specific toxic substances (aggressins) which it contains, and in consideration of the limited amount of such extract which is available from an affected animal the attention of investigators has been directed to the production of such specific toxins (aggressins) in the laboratory; and with this in view, special culture media containing a definite proportion of meat has been inoculated with active blackleg cultures which resulted in a very prolific growth with tremendous gas-formation.

On following this method of cultivation it is noted that in the first few days a very active propagation of the blackleg organisms takes place in the media, further, a disintegration of the meat is noted, and a heavy layer of blackleg organisms settles to the bottom of the container. In the first few days, upon examination, it is found the growth consists of the vegetative forms of the organisms, and with the diminishing of the gas-production, an increase of the spore form of the blackleg organism is noted. The conclusion of the growth is indicated by an entire cessation of the gas, and on the bottom of the container a heavy sediment consisting almost entirely of spores of the blackleg organism is present. At this stage, the meat appears to be disintegrated and becomes of a mushy consistency. For the preparation of the filtrate, the cultures are subjected to various procedures to facilitate the task of filtering out the organisms, since it is absolutely essential that the finished product shall be entirely free from the spores or from the vegetative form of the organism. The technic of this procedure does not require any special skill and consists chiefly of the laboratory routine, employed along the same lines as those used for the production of the different biological products.

This method of procedure has been developed in Japan where at the present time, the germ-free filtrate is used almost uniformly for vaccination purposes against blackleg. From information which I obtained personally from Professor Nitta of the Tokio University it appears that this product is placed above all others which we have at our command for immunization against blackleg, and I have been told that the filtrate appears to afford a uniform protection; and besides this, the losses following vaccination, or incidental to vaccination, are thereby entirely avoided.

In order to determine the value of this method of immunization, the writer undertook investigations along this line and substantiated in every particular the results obtained in Japan. In the course of the experiments, it suggested itself to determine whether other culture media than that described above might be employed for the production of a germ-free filtrate and with this in view duplicate tests were made with culture media—one containing the meat and one without the meat. The results were very convincing as to the necessity of having the meat in the media, since the filtrate obtained from this culture media possessed great immunizing value when tested out on calves, whereas the

filtrate prepared from the media not having the meat failed to show any signs of protection. It was likewise noted that the gas production in the media containing the meat was tremendous, whereas in the other flasks only a moderate gas-formation took place.

In the dosage of the filtrate, the recommendations for the Japanese product were followed, namely,—5 c.c. for immunizing purposes. Since, however, it appears advantageous to reduce the dosage to a quantity which can be more conveniently handled, attempts were made toward concentrating the filtrate. This has been successfully accomplished in vacuum driers without subjecting the product to a temperature exceeding 40°C. The filtrate is then preserved with a definite percentage of glycerin to increase its keeping qualities.

Guinea-pig tests which were at first employed exclusively for the standardization of the product proved that injections of 0.2 c.c., 0.3 c.c., and 0.5 c.c. of the concentrated material when followed in ten days or two weeks' time with an injection of virulent blackleg virus, produced a distinct immunity in the animals, since the control pigs receiving the virus died and the immunized animals survived.

The tests on the guinea-pigs should be carried out as follows:

In all eight quinea-pigs are used of which two serve as controls. Two of the remaining six receive 0.1 c.c.; two receive 0.4 c.c.; and two 0.6 c.c. of the filtrate. After ten days all pigs are injected with 0.5 c.c. of virulent blackleg virus. The virus is prepared by taking dried blackleg tissue, pulverizing it and mixing it with distilled water in such proportions that there will be about equal amounts of fluid and sediment. Of this coffee colored mixture, 0.5 c.c. is injected into each guinea-pig. It is required that at least four of the immunized guinea-pigs should survive and both of the controls should die from the injections.

The product has also been subjected to other severe tests on calves, in which the calves, after injection of the blackleg filtrate were subjected in two weeks' time to an injection of 5 c.c. of blackleg virus, an amount which is used to infect calves with blackleg for the production of vaccine. Five calves which have been inoculated in this manner resisted the infection and only in one instance did a swelling appear at the point of injection of the virus.

With reference to the duration of the immunity produced, all the investigations indicate that the period extends for about one year. That is, the same length of time as the immunity established by vaccine or by germ-free extracts. There is no conclusive information available whereby permanent immunity might be produced from the injection of any blackleg product. Of course, it is realized that the vaccination of calves with an effective product would induce an immunity which would protect the animal during its time of greatest susceptibility, and since the immunity produced by the vaccination vanishes only gradually, the proportion of infection in effectively vaccinated animals would naturally be very insignificant.

SUMMARY. 1. Blackleg filtrate is an effective immunizing agent against blackleg.

2. Blackleg filtrate confers an active immunity, which protects cattle against the disease for as long a period of time as the germ-free extracts (aggressins) prepared from the juices of the tissues from affected cattle.

3. Since it does not contain the blackleg germ in any form it can not produce the disease, therefore losses incidental to vaccination with the powder or pellet form are entirely avoided.

4. Blackleg filtrate may be prepared in a concentrated form and when suitably preserved, will retain its potency for an almost indefinite period of time.

5. It is essential to subject the blackleg filtrate to the various tests for sterility, both during the filtration and filling processes in order to guard against any possible contamination.

—The new Tennessee Serum Law provides that it shall be unlawful for any person, firm or corporation to distribute, sell or use in the State of Tennessee, any serum, virus, or other biological products intended to be used for the treatment or prevention of infectious or communicable diseases among swine unless such serum, virus, or other biological products are prepared or manufactured in establishments located at least eight hundred feet from any public stock yards, garbage disposal, or rendering plant to which garbage or dead animals are hauled over the public streets or highways.

CLINICAL AND CASE REPORTS

"Knowledge is born in laboratories and in the experience of the thoughtful. It develops form in the journals and 'when dead it is decently buried in books'."

CLOVER BLOAT

DANIEL J. HEALY AND JOHN W. NUTTER
From the Kentucky Agricultural Experiment Station, Lexington, Ky.

As is well known, tympany, or bloating, in cattle may follow the ingestion of certain feeds. A sudden change, after the winter season, from dry feed to a green, succulent feed of any kind may induce bloating. Alfalfa and clover, especially the red and white varieties of the latter while in flower, are particularly dangerous in this respect; turnips, potatoes, and cabbage may induce bloating; middlings and corn meal frequently do so. Grass or clover, when wet with dew or rain or when covered with hoar frost, should be regarded as dangerous.

SYMPTOMS.—As a rule the onset of bloating is rather sudden. The animal is anxious, moves uneasily and is distressed. The swelling of the left flank is characteristic and in marked cases the upper portion of the flank rises above the level of the back, and when struck with the finger-tips resounds like a drum. The breathing becomes more difficult; the animal reels on walking or standing, and in a short time falls and, if not relieved, dies from suffocation.

During the spring of 1913 several cases of bloating occurred in the Experiment Station dairy herd and thus our attention was called to the necessity for further study of the condition. Following the unusual production of clover in the pastures in 1913, the growth of grass in the spring of 1914 was so luxuriant that very little clover appeared and we did not have a single case of bloating in 1914. During the spring of 1915, the clover was again returning and five cases of bloat occurred in the dairy herd. The spring of 1916 presented the banner crop of clover in the pastures, in many cases the clover blossoms at a distance resembling snow. This spring also afforded the greatest number of cases of bloat, there occurring, in all, ten cases in the dairy herd. The first case occurred before the clover blossomed.

We were able to demonstrate that red and white clover blossoms, alfalfa blooms and, in seasons of luxuriant growth, clover

leaves contained sufficient quantities of sugar, and were contaminated with sufficient numbers of either wild yeasts or sugar splitting microorganisms to cause an active fermentation in the rumen of cattle eating heartily of them, and that this process is a true fermentation.

In clover bloat, as in many other conditions, an ounce of prevention is worth a pound of cure. When, in the spring, cattle are first turned on clover or other green feed the change should be made gradually, and this is best accomplished by having the cattle graze for twenty to thirty minutes the first day on pasture and increase this period each day until the digestive organs become accustomed to the green, succulent food. During the early weeks of spring, cattle should not remain in the pasture over night nor be turned on pasture while the dew or frost is on the grass. An excellent practice is to feed cattle a little hay or other dry feed just before turning them on the pasture. Watchfulness during a week or two of early spring will prevent many cases of bloat.

When bloating does occur it may be promptly and efficiently relieved by drenching the animal with one quart of a one and a half per cent solution of formalin in water, at the same time propping the mouth open with a block of wood and, if possible, including gentle exercise. After the animal has recovered, a second drench, composed of one pound of Epsom salts and half an ounce of ground ginger in one pint of tepid water, should be administered. Formalin is a trade name for a 40 per cent solution of formaldehyde gas in water and may be obtained at any drug store. One-half ounce of formalin added to one quart of water makes the proper solution with which to drench the animal.

During the past four years we have used this formalin treatment for clover bloat with marked success. During this period we have had eighteen cases of clover bloat in the Experiment Station dairy herd. Two of these cases died before any treatment could be used. The remaining sixteen cases received the formalin treatment, and fourteen of them promptly recovered in from twenty minutes to one hour. Two of the cases did not recover promptly and were punctured after which they did promptly recover. Two of the cases went off feed and the milk diminished following the clover bloat with formalin treatment, but returned to normal conditions with full milk production after a few days.

In severe cases it becomes necessary to puncture the paunch,

and in such cases the paunch should be promptly punctured. The instrument used for this operation is made in two parts, a trocar fitting within a canula, similar to a sword in its scabbard. This instrument is first sterilized by boiling a few minutes in water containing a small quantity of washing soda, or by immersing in 50 per cent alcohol for 5 to 10 minutes. The sterilized instrument is now boldly plunged through the skin of the animal's left side, midway between the last rib and the hip bone, into the paunch, and the trocar withdrawn from the canula. The latter remains in position and allows the gas to escape from the paunch. This operation will be less dangerous if the animal has been first drenched with the formalin solution. When the animal is relieved the above Epsom salts and ginger drench should be administered.

URETHRAL CALCULUS IN A DOG

H. J. Milks and W. E. Muldoon, Ithaca, N. Y.

Patient was a male Boston bull dog in a more or less emaciated condition.

History. This animal showed much difficulty in urination, and had been running down in condition for some time. He had been treated for the past five months by several veterinarians and physicians without results. Five X-ray plates had been taken of the abdomen and the pelvis but these showed nothing of importance.

Symptoms. The pulse, respirations, and temperature were normal. The animal showed some nervousness and when taken out of doors on a leash would place himself in position to urinate and strain without result, or at times there would be a dribbling of the urine mixed with blood and on some occasions the first few drops would dribble away and after this the urine would pass in a full stream, apparently normal in color.

Diagnosis. The animal was given one-half grain of morphine sulphate subcutem, and one-half hour later placed upon the operating table. The penis was protruded and a small catheter was passed up the urethra until a grating obstruction was met at about the middle of the os penis. A diagnosis of urethral calculus was made and the parts prepared for operation.

Treatment. The skin of the prepuce was shaved and then disinfected with a one to one thousand solution of alcoholic sub-

limate. An incision was made through the prepuce and urethra down upon the calculus which was then removed. This calculus was very rough, about 5 millimeters in diameter and flattened upon one side. The catheter was then passed into the bladder to be sure that there were no further obstructions, and the bladder was flushed out with a four per cent solution of boric acid. The wound was not closed with sutures. For a few days the urine was passed through the incision but on the fifth day the wound was closed and the urine was passed in the regular manner. A catheter was passed daily to prevent stricture and the patient discharged at the end of two weeks.

A PECULIAR CIRCULATORY DISTURBANCE FOLLOWING STRANGLES

R. R. Bolton, Ames, Iowa.

On October 27, 1916, a four year old gray mare was brought to the veterinary hospital for treatment to improve her condition. The mare had been worked hard every day during the spring and summer until about two months previously when she contracted strangles. Since her recovery from strangles a large swelling had remained along the sternum and belly. Now and then large round swellings suddenly appeared over the surface of the body and disappeared after a time.

Symptoms. Respirations 30; pulse 54; temperature 100.9°. Three or four scars remained in the region of the submaxillary lymph glands. Animal very languid and much depressed. Condition poor, hair coat dry, harsh and lustreless. Appetite good. Feces voided in hard, shiny pellets and quite dark. Mucous membranes pale. Extensive non-inflammatory edema along sternum. Carpal joints slightly distended. An examination of the circulatory system revealed the following: mucous membranes pale. Pulse at the mandible regular, with fullness of the artery and strength of the pulse unequal.

Heart impulse regular but unequal in strength. At times the heart impulse was very strong and then became imperceptible. The heart impulse and the pulsation in the mandibular artery agreed in frequency.

A very marked negative jugular pulse was present which extended up the neck along the jugular furrow about three inches from the entrance to the thorax and showed a double undulation at each cardiac cycle.

Auscultation of the heart revealed three heart sounds, the first sound loud and distinct, the second sound doubled into two separate and distinct sounds as lubb-dupp-dupp. After forced and rapid exercise for a few seconds the pulse at the mandible became imperceptible, the heart became bounding at the rate of 102 per minute shaking the thorax and causing an extremely strong impulse on each side of the thorax over the cardiac region. The second heart sound was entirely absent during the bounding of the heart.

The jugular pulse was accelerated and appeared like a tremor in the jugular furrow at the entrance of the thorax.

Respiration was dyspneic, the animal holding the nostrils widely dilated. The heart slowed down very quickly so that both the heart sounds could soon be heard, and as the heart action slowed down the pulse at the mandible became gradually more perceptible.

DIAGNOSIS. Tentative diagnoses were made as follows: 1. Stenosis of the mitral valve. 2. Stenosis of the tricuspid valve. 3. Stenosis of the tricuspid and mitral valves.

October 28, 1916. Respirations 28; pulse 42; temperature 102°. No change in the conditions above described could be noted.

October 30, 1916. Respirations 27; pulse 48; temperature 102.2°. Well defined bolster-like edematous patches, about the size of a man's hand, were present on each side of the neck close to the jugular furrow, on each side of the thorax near the upper part, and on each side in the lower flank region. These were considered as evidences of urticarial eruption. Doubling of the second heart sound could not be heard.

An examination of the blood gave the following: Hemoglobin 45%; erythrocytes 6,072,000; leucocytes 11,333; small mononuclears 0.45%; large mononuclears 17.9%; eosinophiles 2.24%; polymorphonuclears 78.5%; mast cells 0.89%.

October 31, 1916. Respirations 20; pulse 52; temperature 100.4°. The edematous swellings were more extensive, and doubling of the second heart sound was again in evidence.

November 1, 1916. Respirations 20; pulse 47; temperature 100.4°. The edematous patches on the sides of the neck, thorax,

and flank had disappeared. The edema along the sternum still remained, otherwise the condition was unchanged. An unfavorable prognosis was given and the mare was taken home. A request to perform an autopsy at death was granted.

On March 17, 1917 a call at the owner's place found the mare much improved in condition, and doing work every day. The owner stated that she had fully recovered and that her endurance for work seemed fully restored.

POTASSIUM PERMANGANATE AS AN ANTIDOTE FOR THE EFFECTS OF POISONOUS PLANTS

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Bureau of Animal Industry, Washington, D. C.

The treatment of animals affected by plant poisoning with potassium permanganate is very generally recommended in works on veterinary medicine and in publications relating specifically to poisonous plants. This treatment seems to have become established as a recognized routine procedure. It may be well to point out emphatically that, for practical purposes, in the case of ruminant animals,—and ruminants suffer most from poisonous plants,—the use of a drench of potassium permanganate is without value. This was brought out in Bulletin 365 of The U. S. Department of Agriculture, but seems to have escaped general notice, as state bulletins and other publications continue to recommend the use of this remedy.

From the standpoint of the chemist, of course potassium permanganate, tannic acid, or sodium bicarbonate would be logical antidotes for alkaloidal poisoning. These substances are effective, however, only as they come in actual contact with the poisonous substances. In the complicated digestive system of a ruminant, only that part of the drench which passes into the abomasum will be effective: there it may serve as an antidote to the poisonous substance which is passing through that organ. That portion of the drench which passes into the first three stomachs is lost in the mass of organic matter which they contain, and produces little if any effect. It has been shown experimentally that if the antidote is given repeatedly, at short intervals, it is effective, for then it attacks the poisonous substance as it passes through the abomasum.

By short intervals is meant once in thirty minutes or less. Continued treatment of this character is impracticable in most cases of poisoned animals, although it might be used in the case of a single valuable animal.

It may be added that the U. S. Department of Agriculture, as the result of extended experiments on the treatment of animals affected by poisonous plants, has entirely abandoned the use of potassium permanganate, unless, as indicated above, there is an opportunity for continued treatment.

PHENOL POISONING?

R. R. Downing, Wellman, Iowa.

On the evening of April 19th, I was called in haste to see a colt. The owner informed me over the phone that he had just washed the colt to kill the lice. Upon arriving at the farm, instead of finding one colt, I found three down and one standing shivering. My first thought was, a severe chill, but upon close examination, found the following: muscular paralysis; pulse, 75 to 100; respiration, rapid but some dyspnoea; temperature, sub normal and intense pain. I at once began to question my client more closely as to just what he had done and what he had used.

About one year ago he had purchased some Dip of Watkins (Patent Medicine) and it had remained until this time without being opened. He said he used it plenty strong and in cold hard water, after which he rubbed it in with a brush. I then asked to see the container which led to my diagnosis.

On the container was *Shake Well,* which my client did not do, and the composition in part was phenol. I at once decided that phenol poisoning by absorption was the cause.

As Iowa is bone dry there was little chance to get any alcohol, but as this farmer believed in preparedness, we were not long rustling two quarts of spts. frumenti. This I gave in large quantities (to the horses) but as the supply was limited, did not attempt to apply externally.

The owner applied the solution at 4 p. m. and at 8 p. m. one horse died and at 8:05 the second, but the other two rallied and made a recovery. What is the opinion as to my diagnosis and what is the best treatment?

ACUTE HEPATITIS AND NEPHRITIS OF THE HEN

B. F. KAUPP, Pathologist
North Carolina Experiment Station, West Raleigh N. C.

HISTORY. A single comb white leghorn pullet; a member of a high producing flock bred to lay. Her leg band number was C1.60, spirelette-yellow. She was hatched April 7th, 1916, and began laying at the age of eight months. She had laid 34 eggs up to the time she had taken ill which illness began about four weeks before her death.

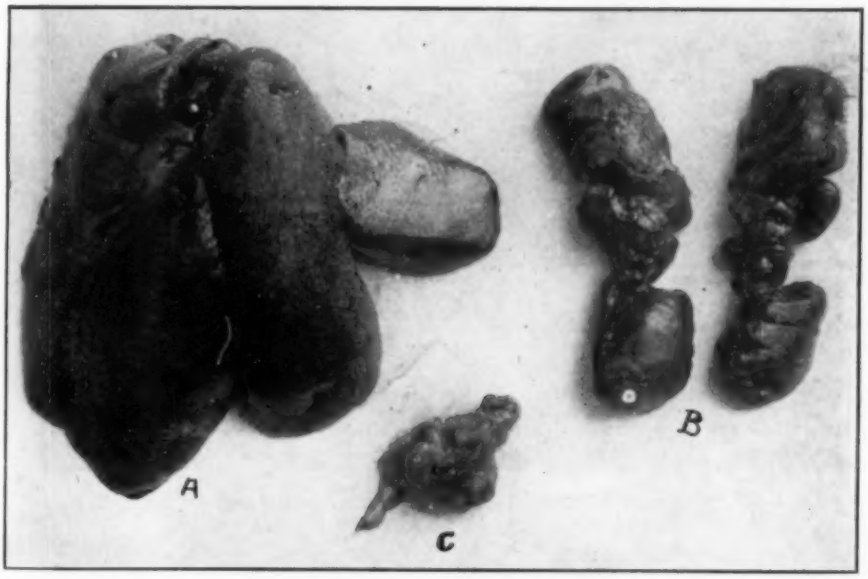


Figure 1. A—Acute hepatitis of a hen. (photograph).
B—Acute nephritis and C—intestinal tumefaction of same.

The first symptom she showed was an unsteady gait. She would sit around much of the time. These symptoms became more aggravated and finally there was inability to properly handle her limbs and somewhat paralyzed floundered around in the coop. She was taken to the hospital and died on March 25th, 1917.

PROTOCOL. Autopsy—The vent feathers were somewhat smeared indicating some diarrhea was present. This discharge was of a greenish-yellowish fluid nature.

The comb and unfeathered portions were purplish, other-

wise appearing normal. The plumage was in an unkempt condition. The carcass was thin in flesh.

Upon opening the abdominal cavity the liver was noted to be enlarged with grayish mottled patches over it. The liver weighed 170 grams or 5 times its normal weight. The gall bladder was distended with a light watery appearing bile—quite unnatural in its appearance.

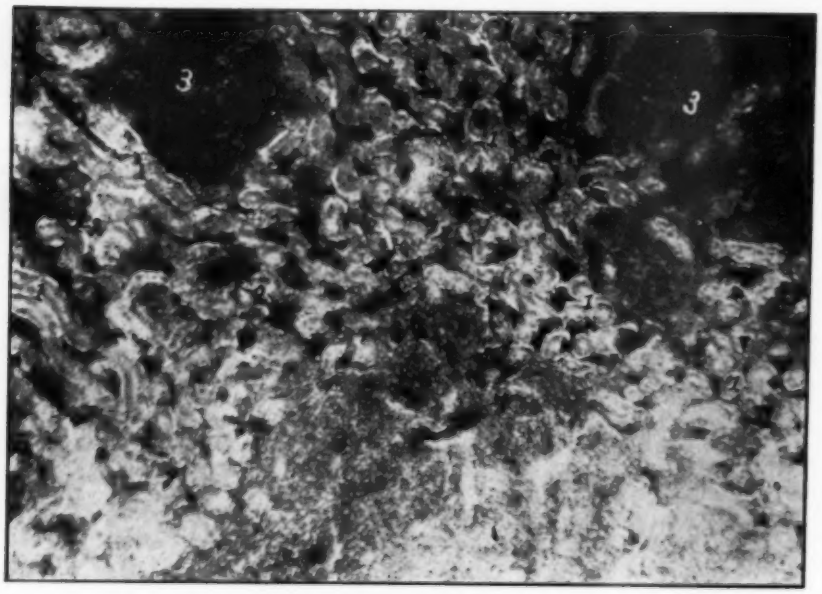


Figure 2. Nephritis of a hen. Photomicrograph of a section from Figure 1. letter B.
1—The tubules.
2—The congested vessels.
3—Cellular infiltrated areas.

There was an absence of abdominal fat. There was a tumor on the free portion of the small intestines which measured 3x2x1½ mm. in its three diameters. The intestine at this point had slightly ruptured and a round worm (a male ascaris inflexa) was visible in the tumefaction, but further examination was deferred till the specimen had been hardened in formalin solution.

Figure I, letter A, shows the liver with its mottling indicating the cellular infiltrated areas. Letter C is the tumefaction removed from the intestinal wall. At I can be seen the worm partly protruding through a tear in the mass.

The kidneys were greatly enlarged, the anterior lobe being the larger. Figure I, letter B, shows the right and left kidneys, respectively, the anterior lobe being uppermost. The cellular infiltrated areas can be noted in the cut as mottled areas.

The kidneys appeared mottled gray, similar to the liver and both kidneys weighed 49 grams.

Microscopic Study. Sections were made from the tumefaction and stained in hematoxylon and eosin and clarified in beech wood creosote for study. This mass was made up of delicate connective tissue septa the acini thus formed being packed with mononuclear and polymorphonuclear leucocytes most of which possessed nuclei with chromatin net knots stained very deeply, making it appear somewhat like the first stages of caryorrhexis.

Similar sections were studied from the kidneys. There were found islands and tracts infiltrated with similar cells as those found in the tumefaction. The cells of the tubules were granular and in a high state of albuminoid degeneration and their nuclei almost without fail showed the same characteristic nuclear staining as in those of the tumefaction from the intestine. The cells of many of the convoluted tubules had separated from their base and the lumen had become obliterated, the cell mass pushing to the center. Some cells had lost their nuclei and were in a state of necrosis. In fact there were all stages of cloudy swelling on to necrosis. The glomerules were congested and shrunken—a state of glomerulitis. We therefore found a state of nephritis involving both glomerules and tubular portions. The vessels were congested, this held good for those of the cortical as well as those in the medullary portions.

Sections of the liver similarly prepared showed cellular infiltrated irregular areas in just the same manner as the kidney. These areas were infiltrated with similar cells being mononuclear and polymorphonuclear, principally the latter. Both active and passive congestion were present. The chromatin net knots took deeply the basic stain similar to those of the kidney and tumefaction of the intestines.

Figure number 2 shows a photomicrograph of a section through the kidney substance. This was from near the outer portion. Number 1 shows the tubules. Number 2 the congested vessels. Number 3 are the areas infiltrated with cells.

A similar case was later studied in another pullet from this same flock. The gross studies and the microscopic studies were the same with the exception that the liver weighed 352 grams (the normal weight of the average liver of a hen is approximately 35 grams) and the two kidneys weighed 54 grams.

SUMMARY. Two cases of acute hepatitis and nephritis, both in association with each other, were studied in two single comb white leghorn hens.

In these cases the livers and kidneys were greatly enlarged.

The outer surface of the organs in cases of acute hepatitis and acute nephritis presents a mottled whitish appearance.

LEUKOMA IN A DOG

H. J. MILKS AND W. E. MULDOON, Ithaca, N. Y.

Patient was a well nourished, spayed, Airedale bitch, about one year old.

HISTORY. The animal had recovered from an attack of dog distemper some two months previously, leaving no noticeable sequelae.

SYMPTOMS. The pulse, respirations, and temperature, were normal and nothing out of the ordinary noted except a marked cloudiness of the cornea of the left eye. On close examination of this eye no wound, scar, or ulcer could be found that would give rise to this opacity. The cloudiness covered the entire cornea and was of such a degree that the sight was entirely destroyed. The right eye was normal.

DIAGNOSIS. A diagnosis of Leukoma was made and the following treatment followed:

TREATMENT. The eye was washed with a boric acid solution for two days and a few drops of a five per cent solution of silver nitrate instilled twice daily. From the third to the ninth day a one-fourth grain tablet of dionin was powdered and placed into the eye, after washing with boric acid solution. At the end of this time the opacity had entirely cleared up and the eye had apparently returned to normal.

ABSTRACTS FROM RECENT LITERATURE

Post Mortem Lesions. Canis Major. *Veterinary Record.*—1st Case. A cocker spaniel bitch was destroyed on account of bad habits. The bladder was found containing a calculus weighing nearly one ounce. The animal had never shown any signs of illness during her life.

2nd Case. Brindle bull dog had the appearance of a very sick animal. Its skeleton was prominent, the frontal muscles had almost disappeared. It was reported as having always had a good appetite. Destroyed; the post mortem revealed the presence of a large, flat cork, one of the pickle bottle variety, which was wedged in the pylorus.

3rd Case. Aged fox terrier destroyed on account of age and infirmities. The post mortem revealed: a diseased spleen. At the margin of the organ, there was a tumor, about two ounces in weight and similar in its substance. These when examined were found to be spindled celled sarcoma. The dog had lived long and was comfortably healthy all the time, except for some two years previous, when the owner had thought he had some internal growth.

4th Case. Irish terrier puppy. Damaged by a motor car had complete paralysis of the head and neck. Prognosis unfavorable. He was destroyed. Fracture of the odontoid process of the axis was found with bone loose.

5th Case. Cat had been ill for a few days and was destroyed. Post mortem showed purulent peritonitis. A growth involving the mesentery and a perforation of the cecum, evident cause of the peritonitis. The liver was studded with small abscesses.

6th Case. Old cat, an old patient, treated many times for inability to retain food. He was very much emaciated. Post mortem exhibited an enlarged cirrhotic liver with disease so far advanced that it was difficult to cut into the organ.

Liautard.

Entero-Hepatitis or Black-Head in Turkeys. Charles H. Higgins. *Bulletin 17, Dept. of Agriculture, Canada.*—Most of the theories in regard to the cause, nature and course of the disease are familiar. The post-mortem findings are characteristic. Muriatic acid has been found useful in treating the disease. A teaspoonful of the acid (Acid. Mur. Dil. B. P.) is used in a quart of drinking water placed in a porcelain or glass vessel. Three times

the amount of acid may be used for the first three days when the birds are severely affected. Acid is used because of the increased alkalinity of the digestive tract during the course of the disease.

Black-Head is prevented by artificial incubation and by isolation of the birds. Plots of one acre were alloted to about 25 turkeys. The plots are separated from each other by lanes so that separate flocks cannot come in contact with each other or other animals. Colony houses are built on each plot and given the best possible conditions. Plots are so arranged that attendants cannot pass from one directly to the other and thus carry infection. Special attention is given to the food of the poults. Strict sanitary precautions are taken in respect to the colony houses. All refuse is burnt as near the shelter as is safe to prevent infection being carried. Five per cent crude carbolic acid in hot lime wash or Cresol Compound U. S. P. in hot lime wash are good disinfectants and should be applied to all parts of the house. Strict watch is needed that infection is not carried from infected houses to poults by wearing apparel of the attendant. HAYDEN.

TORSION OF THE UTERUS IN A SLUT—HYSTERECTOMY—RECOVERY. Mr. Cholet. *Bullet. de la Soc. Cent.*—A four year old pointer was found to be pregnant, but the time of her delivery was not exactly known. After a time she had pains, her appetite diminished, the vulva had not changed. There was no discharge, the abdomen got large and painful on pressure. The milk secretion stopped. The author was called and after examination per vagina made the diagnosis of distocia of mother origin, with metroperitonitis.

Laparotomy was urgent and after proper preparation, anesthesia with atropo-morphine and chloroform with injection of physiologic serum, the abdomen was opened, a sero-bloody fluid escaped and the uterine horn was found gangrenous. There was local peritonitis and the gravid horn was adherent to the tissues surrounding. While freeing it, it was torn, and a dead fetus came out. The left horn was thus made empty, but the right contained two fetuses. It was twisted, having made a half turn drawing the left and it was that twist which had prevented the delivery and as the twisting of the uterus could not be relieved the broad ligaments were ligated; the uterine body secured with a clamp and amputated. The abdomen was washed with physiological serum, the

sero-muscular wall was closed with silk, the skin with Florence thread. Warm water bottles, blankets, injections of caffeinated physiological serum with careful diet were followed by cicatrization, partly by first intention and in other areas with suppuration and, after fifteen days, recovery. LIAUTARD.

RABIES. CARPANO (Matteo). Su di un metodo rapido di colorazione dei corpi di Negri nella rabbia e sulla speciale struttura che si mette in evidenza col metodo stesso. (A Rapid Method of Staining Negri Bodies and the Special Structure of these Bodies brought out by this Method). *Clinica Vet.* 1916, June 15-30, Vol. 39, Nos. 11-12, pp. 347-359. (Reprint).

The following technique for staining Negri bodies is recommended by Carpano. Smears fixed in Zenker's solution or absolute alcohol or sections imbedded by the acetone method, or, better, after fixing in Zencker's fluid by the usual methol, are stained with a combination of Eosin-crystalviolet.

Three staining solutions are necessary:

1. EOSIN.—Eosin red (ethyl) or, better, eosin yellow.....1 gram
   Distilled water .....100 c.c.
2. CRYSTAL VIOLET.—Crystal violet .....1 gram
   Alcohol (95 per cent) .....20 c.c.
   Dissolve and add a solution of 2 per cent phenol in distilled water 500 c.c.
3. IODIN.—Iodin .....1 gram
   Potassium iodin .....2 grams
   Distilled water .....400 c.c.

The directions for staining are as follows:

1. Ten drops of solution 1 are placed on the smear or section for about one minute, poured off and without washing are passed into 95 per cent. alcohol.

2. The moist slide is then covered with about 10 drops of crystal violet solution 2, the preparation is warmed until vapors begin to rise, for about five minutes.

3. This stain is poured off the slide and without previous washing a few drops of solution 3 are put on and left for one minute.

4. The last solution is then also taken away and the preparation decolorized in 95 per cent. alcohol until the violet color has almost disappeared.

5. The preparation is quickly dehydrated in absolute alcohol, clarified in xylol and mounted in balsam.

Beautiful preparations which show remarkable structural differentiation of the Negri bodies can thus be obtained. Carpano describes definite growth and evolution of these bodies. For details, those interested are referred to two very interesting plates.

K. F. MEYER.

VISCERAL PSEUDO-TUBERCULOSIS AND CASEOUS ADENITIS IN SWINE. Dr. P. Chausse. *Recueil de Med. Vétérinaire.*—There are frequently in swine glandular caseous lesions with the form of nodules from visceral tubercles, which it is difficult to distinguish from true tuberculosis. From a few clinical observations which are recorded, the author shows that there are frequently in swine nodular caseous growths which are not tuberculous and which it is difficult to distinguish from true tuberculosis. The following characters will help to make the distinction: Nodules that are not tuberculous are not regularly spherical, they have no fibrous envelopes; their caseification is complete and uniform with calcification. They are of a color of putty or greenish.

In the lesions due to Koch's bacillus, on the contrary, the nodular form is rare in the lymph glands of swine. If the tuberculous lesions are several months old, the viscera are involved in the generalization, while in pseudo-tuberculosis they are not or exceptionally so. If pseudo-tuberculosis and true tuberculosis exists in the same animal, the diagnosis may be difficult but the detection of the second affection is sufficient. Lesions of pseudo-tuberculosis are easily distinguished from the parasitic tuberculosis of the liver, echinococci and cysticerci. LIAUTARD.

PROVIDING MEAT FOR PARIS IN 1870 AND IN 1914. G. Moussu. *Recueil de Médécine Vétérinaire,* Vol. 92, pp. 224-229, 1916.—We ought to profit from past experiences. I will state what happened in 1870, under conditions comparable with those that face us now. The concentration of live stock into the capital began in September 1870. By October 4, there were 40,000 cattle, 220,000 sheep and 12,000 hogs in the parks. These figures may look big, but this was an extremely small reserve for the enormous daily needs of Paris. By the end of November, 1870, the reserve had been exhausted or the little that remained was set aside for hospital use exclusively.

Disease depleted the herds in Paris. This was a depreciation factor which apparently had not been considered by those charged with the grave responsibility of provisioning for a siege. This

disease factor is an invariable one in all great concentrations of live stock; it has occurred at all times and among every people; it is this alone which condemns the principle of permanent parks for raising cattle. Scientific progress has today placed other means at our disposal. Foot and mouth disease decimated the cattle; sheep pox (clavelèe) made terrible inroads upon the sheep in spite of rapidity of slaughter and vaccination (12,000 were saved out of 30,000 vaccinated).

In December, 1870, it became necessary to eat horse flesh. Out of 75,000 horses then in Paris, 70,000 were slaughtered; i. e., the entire Parisian cavalry. This was easy in view of the fact that forage, oats, etc., for the horses were lacking. By January 1, 1871, the rations of horse flesh had been reduced to 40 grams per person (2 ounces). Paris succumbed to a famine.

Economists have indicated over 15 years ago that we ought to profit by the discoveries of Ch. Tellier, and construct refrigeration plants in which slaughtered meat shall be stored in reserve in quantities proportionate to the number of population and for whatever length of time the reserves are to last. Have the lessons of the past been of any use to us?

The German armies in 1914 were precipitated toward Paris with such momentum that had they not been retarded by the Belgian forts, they would have arrived at the capital before the parks could have been stocked for the maintenance of the calculated number of cattle. If the siege had begun in September, the situation would have been no better than it was in 1870.

If one sums up the expenses of construction of parks for live stock, the losses due to diseases, accidents, depreciations, etc., which represent only the inevitable losses, one arrives at figures which permit the construction of store houses more than sufficient for the preservation of all the meat furnished by the herds of Paris. And these warehouses would represent stable values which would not depreciate after the war since they could continue to be used for the storage of numerous foods. BERG.

AN UNUSUAL CASE. J. Wilson Barker, M.R.C.V.S. *Veterinary News.*—The case was observed in a horse, 4 years old. He presented an abnormal condition of the fore limbs and presented the condition known as "Knock-Kneed". Sometimes while standing, the off knee was brought across the near one. The animal

could trot and gallop sound when out at grass. Under the saddle he trotted and walked sound, rarely stumbled.

After a thorough examination, no heat and no splint were found. There was a bony enlargement above the knee and one below on the outside of the metacarpal bone. The feet were in good condition. The horse brushed badly on the near hind leg. He ate and masticated slowly. His mouth and teeth were in good order.

The writer asks the cause of the condition of the fore limbs. Is it osteoporosis? It is hard to answer. LIAUTARD.

A NEW DEFECT IN MILK CAUSED BY BACTERIUM LACTIS AEROGENES ESCHERICH. Max Duggeli. *Zeitschrift für Gärungsphysiologie*, Vol. 5, No. 5, pp. 321-340, 1916. *Abst. from International Rev. of The Science and Prac. of Agric.*, Year VII—No. 9, Sept. 1916, p. 1363.—The writer received for examination 2 samples of bottled milk suffering from an hitherto unknown and very pronounced defect, although the samples reached the laboratory only 48 and 60 hours after milking. They came from a model cow-house of 36 cows producing best quality milk, obtained and handled with the utmost cleanliness, afterwards filtered, cooled to 12-14°C., and bottled for forwarding to the consumers. When the milk from this shed had been kept for some time, a bitter taste was observable, together with a typical rancid smell, especially noticeable when boiling the milk; and this fault became more strongly pronounced as the time of keeping was lengthened.

All attempts to discover the presence of bitter substances failed.

The ration of the cows was made up of good hay and crushed barley, not very fresh it is true, but of normal bacteriological composition. On studying the fresh milk of the 36 cows separately no result was obtained, but by keeping the different specimens of milk it was detected that the defect was due to one cow with a diseased teat, an old animal which had been in milk for a year and a half.

A thorough bacteriological study of the above 2 specimens of milk was made, all kinds of cultures being prepared. The writer succeeded in isolating a bacterium belonging to the group *Bacterium lactis aerogenes* Escherich, but differing from the stock form of Aerogenes, and he considers this to be the cause of the defect in

question. It not only gives rise to abnormal smell and taste in the milk, but also possesses the property of making glucose bouillon very ropy. Furthermore, even in the presence of *Bacterium Güntheri* L. et N., it prevents the coagulation of the milk. On cultivating the bacterium producing the defect in question on lactose agar, the characteristic taste and smell disappear, but they can be made to reappear in part by afterwards cultivating the bacterium in a suitable medium (decoction of teat substance).

REICHEL.

GANGRENOUS MAMMITIS IN CATTLE. J. H. Ripley, M.R.C.V.S. *Veterinary Journal.*—As soon as diagnosis was certain, chiefly by noting the thin, bloody fluid obtainable from the teat in conjunction with the general symptoms of septicemia, some five or six deep, narrow incisions were made into the udder substance by means of an abscess knife. These incisions were 2 inches deep but only large enough to admit the nozzle of a syringe with which the wounds were syringed three times a day with hypochlorous acid solution. The next day, the punctures were enlarged and eventually by joining one to another a long incision was formed. Adhesions of the gland to the skin were easily broken down with the fingers and such bleeding as took place was stopped by plugs of tow soaked with the solution and oil. Continued syringing of the wounds with the solution while turpentine was given internally completed the treatment. The dead gland substance sloughed out and healing followed. The important point in the treatment was to allow active interference to be made early and a lot of manual manipulation in getting the gangrenous gland away were avoided.

LIAUTARD.

TUBERCULOSIS OF HOGS. John R. Mohler and Henry J. Washburn. *Farmers Bulletin 781, United States Department of Agriculture.*—Several localities during recent years show a decrease in the number of swine having tuberculosis, but the country at large shows an increase in the number affected. Tuberculous cattle are the principal source of tuberculosis in hogs. The disease is transmitted readily by feeding hogs on unpasteurized dairy products and by allowing them to follow tuberculous cattle in the feed lot where the undigested grain in the droppings is eaten. Hogs are slaughtered young and do not propagate the disease among their own kind to any extent. Of the number of hogs slaughtered in

one city only 2.4% showed tuberculous lesions. These animals were not fed on uncooked dairy products or behind diseased cattle. In the same period the records of four other cities show that from 9% to 25% of the hogs killed had tuberculous lesions. These animals were fed uncooked dairy products or fed behind diseased cattle. Virulent germs of tuberculosis were recovered from separator slime taken from one of the creameries of this region. Hogs are bought by many buyers subject to post-mortem inspection.

Milk and feces from tuberculous cattle are unquestionably the cause of the vast majority of cases of tuberculosis in hogs. Tuberculous sows may infect their litters. Separator sediment taken from 15 different creameries showed virulent germs of tuberculosis in 500, 33 1/3% of the samples. Tuberculosis in hogs can be greatly reduced by creameries being compelled to properly heat their skimmed milk before it is distributed to farmers. Several instances of tuberculous hogs have been traced to infection through feeding on tuberculous carcasses or slaughterhouse offal. No case of tuberculosis is shown to have arisen from the consumption of tankage and it is thus held as a safe and valuable food for swine. Sterilized garbage can be fed to swine with safety and is of great economic value. Uncooked garbage is a source of danger. It is established that hogs may contract tuberculosis through eating the sputum of consumptives. Eating the carcasses of tuberculous fowls also causes the disease.

Intestinal tuberculosis is frequently accompanied by general disturbance of the digestive functions, and diarrhea or constipation may be shown. Advanced cases of the lungs are shown by a persistent, dry, harsh cough and rapid breathing. The cough can not be distinguished from that caused by lungworms. Lameness as a result of disease in the bones and joints is comparatively rare. No symptoms are shown in the majority of cases. The intradermal method of applying the tuberculin test may be used to test hogs. Two-thirds of the volume of tuberculin used in cattle testing is evaporated and two drops of the preparation are injected into the skin at the base of the ear. A swelling, which may remain for 10-12 days, is formed at the end of 48 hours and is proof of infection. Lesions are found most frequently in the throat, bronchial and intestinal lymph glands, liver, lungs, spleen. Lesions occasionally occur in other parts of the body. Lesions of the kidney are extremely rare, only 3 cases in 120,000 tuberculous carcasses

examined. Preventive measures entail the removal of all affected animals, thorough disinfection of the premises, pasteurization of all milk products used for feed by heating to 145°F. for 30 minutes or to 176°F. for a moment, the location and removal of all centers of infection, and spreading information among farmers and dairymen. The extermination of hog tuberculosis is held to be practicable and relatively easy. HAYDEN.

FROZEN MEAT FOR THE CIVIL POPULATION. G. Moussu. *Revue d'Hygiène et de Police Sanitaire*, Vol. 38, pp. 883-892, 1916. On account of the scarcity and prohibitively high cost of meat, it has become necessary for the government to provide a meat supply for the people.

What is frozen meat? It is fresh meat that has been subjected to a temperature of minus 15° or 16°C. and thoroughly frozen, hard like stone or wood. In this condition it may be kept for months or even years, provided that after being frozen, it is kept in rooms at minus 7° or 8°.

Meat that has been chilled at 0° to 2° may be kept for 3 or 4 weeks; this is known as refrigerated meat. England was the first European nation to make use of meats preserved by refrigeration. She has established supply stations along her navigation routes at Gibraltar, Port Said, Hong Kong, etc., so that her ships can be revictualled wherever they may happen to be. England's successful prosecution of the Transvaal campaign was due in part to the abundance of frozen meat supplied to the army and Russia's failure in the Russo-Japanese war was due in part to a faulty organization which did not provide for proper rations.

Because of lack of a reserve supply of storage meat it was necessary, during the first year of the war, from August 1914 to July 1915, to kill large numbers of cattle, both large and small. After a year of war, the number of cattle in France had diminished by more than 2½ million adult head, out of a total effective number of 15 million (young and adult). In 1915 we were poorer in cattle than in 1862.

Should it be necessary to continue the losses of cattle in the same proportion, then cattle raising in France is to-day ruined for a long time and the revictualling of the army and the civil population is irremediably compromised. Various practical difficulties and lack of cooperation between large meat dealers and the govern-

ment make it advisable that municipal meat markets be established for the sale of meat at cost. The military administration is in a position to put a certain amount of frozen meat before the civil population; not for the purpose of totally supplanting the fresh meat, but to correct the present high price of fresh meat.

(Details are given regarding the procedure involved in thawing frozen meat so that its appearance shall remain attractive to the consumer). BERG.

SUDDEN RENAL HEMORRHAGE IN A STEER. Mr. Piot Bey. *Recueil de Médécine Vétérinaire.*—A fifteen year old steer, kept at rest for five days, had general shivering, fell down and died.

The post mortem revealed that all the visible mucous membranes were pale and the abdomen filled with a large clot of blood through the intestinal circumvolutions. This clot ran upward toward the sublumbar region. Rupture of a large blood vessel was evident. After removal of the intestines the right kidney was reached. Its capsule was enormously distended by a clot of blood. There was at its posterior extremity a laceration through which the blood had escaped into the abdomen. It was at the end of this extremity that the hemorrhage started. All the other organs were healthy. The cause of the hemorrhage was determined by the examination of the kidneys. LIAUTARD.

SOME OBSERVATIONS ON THE METHODS OF USING THE AGGLUTINATION TEST IN THE DIAGNOSIS OF DISEASE IN BOVINES CAUSED BY THE BACILLUS OF CONTAGIOUS ABORTION. H. R. Seddon. *Proc. Roy. Soc. Victoria (N. S.), Part II, 1914.*—To found a diagnosis of contagious abortion the materials which may be examined are vaginal or uterine exudate after parturition, foetus or foetal membranes, blood serum, and milk. The agglutination test alone was applied to the whey of milk. In addition to the regular bacteriological methods the agglutination and complement fixation tests were applied to the exudate. Whey was used in a large number of experiments but no conclusion was reached as regards the limiting titres for diagnosis. Whey is a possible material for diagnosis. Of serum taken from ten different steers only one sample agglutinated. The complement fixation method was also positive when applied to that sample. The bacterial emulsion was standardized with barium chloride and sulphuric acid in a weak solution, the so-

lution being made up of 3 c.c. of 1% barium chloride and 97 c.c. of 1% sulphuric acid in water. The agglutination reaction is not simply a matter of dilution but a quantitative reaction for the author's tests shows that the dominating factor is the quantity of serum used and not the dilution. The quantities of emulsion and of serum combining to produce agglutination bear a direct relationship to each other. There is also shown to be a partial inhibition of agglutination with certain proportions of emulsion and serum. With greater or less proportions agglutination may occur. This is an important phenomenon in that the progress of the animal may be compared from time to time.

The optimum amount of emulsion to use is 0.05 c.c. of the author's "Standard 10X" emulsion because it gives a marked naked eye deposit when positive, a definite cloudy appearance when negative, the reaction is complete in 24 hours when the total volume of fluid in the tube is anything from 1½ to 20 c.c., and it is the minimum amount of emulsion that will answer the author's requirements of a good reaction. HAYDEN.

—A glowing tribute was paid to Dr. Francis X. McGuire of the hospital staff of the British Remount Commission at Newport News, Va., April 21. The occasion was the presentation of a handsome silver service as a wedding gift. The presentation also included two beautiful silver vases for the bride elect, Miss Madeline James of Newport News. The presentation was made by Dr. Gregg on behalf of the staff and Dr. McGuire responded with a most appropriate speech. A silver presentation was also made by Major Barry who spoke of Dr. McGuire's long and honorable connection with the depot.

—Dr. Anderson Crowforth of Lockport, N. Y., who suffered from a bite of a rabid dog last December and received the Pasteur treatment, has published in his local paper a communication of much interest and value for laymen. Two cases of rabies in dogs were found in Lockport during the month of April.

—A report from Fort Riley, Kans. states that Major William V. Lusk has received advices from Washington that two thousand veterinarians are needed for the reserve army at once.

ASSOCIATION MEETINGS

AMERICAN VETERINARY MEDICAL ASSOCIATION

REPORTS OF RESIDENT SECRETARIES

COLORADO

During the past year little of special interest to the veterinary profession has transpired in Colorado.

Hog cholera seems to be fairly well under control and is not giving us the trouble that it has during the previous few years.

Excepting very isolated cases glanders is unknown.

An occasional outbreak of anthrax has occurred in the Arkansas Valley, but nothing of a serious nature.

Blackleg seems to be on the increase, occurring often following single vaccination. In these cases double vaccination appears to control the disease.

Hemorrhagic septicemia, which has previously been almost unknown in Colorado, has broken out in a few herds near Denver with a considerable loss in some instances. Vaccination has been quite successful in controlling the outbreak.

Contagious abortion is probably causing us more trouble than any other disease and as a consequence the Station has entered into an investigation of the problem as it especially concerns this state. It is proposed to test a large number of animals, using the serum tests in order to determine the actual prevalence of the disease. It is hoped that control measures may be satisfactorily applied. The practicing veterinarians are using some vaccine, and are having fair results with carbolic acid and methylene blue treatments. However, it is not the consensus of opinion that there has been developed any satisfactory method of handling this disease.

We have a very peculiar problem in that thousands of sheep are fed during the winter months for spring markets and each year the loss in feed lots is something enormous. It is estimated that 5,000 sheep were lost in the San Luis Valley alone during last year, and as many more were lost in the yards in Northern Colorado, and probably an equal number in the Arkansas Valley. From such observations as we have been privileged to make during the past ten or twelve years, it appears to be a feeding problem. A more thorough investigation will be made of the difficulty with a view of outlining methods of prevention.

Larkspur continues to extract its toll from the livestock industry and many cases of actual poisoning, due to this weed. have been investigated by the Experiment Station veterinarians.

The State Association is gradually increasing, both in membership and interest shown.

We have to record the death of Dr. T. H. Quinn of Greeley, who died in Cheyenne about the first of August, and, until his death, was an active member of both the Colorado and the American Veterinary Medical Associations.

I. E. NEWSOM.

IDAHO

There is little progress in the veterinary profession, worthy of note, to report from the State of Idaho. The graduate veterinarians of Idaho all seem to be doing a fairly prosperous business. The main obstacle they have to contend with at the present time is a set of empirical state officials. It so happens that we have a non-qualified, non-graduate state veterinarian and naturally most of his deputies are of the same class. One of the things the state veterinarian has been doing to antagonize the good work of qualified men of the state is permitting the entrance of dairy cows into the state without a tuberculin test. Formerly it was necessary for all cows entering the state to have a tuberculin test. This care together with the wonderful healthful climatic conditions and range life for the cattle has had the tendency to prohibit a greater than two or three per cent of tubercular cattle. Allowing these cattle to come into the state without a tuberculin test is bound to result in an increase in the number of diseased cattle and thus injure the dairy industry for which Idaho seems so well adapted.

Quarantine work for contagious diseases has been sadly neglected by our state officials and as a result hog cholera has raged in many parts of the state during the past year. Best results are reported where there is established infection by using the simultaneous treatment. The veterinarians have had some interference in this work, however, by the state official interfering with the importation of good serum and virus and trying to force them to use the serum manufactured at a non-licensed plant.

During the past year the sheepmen of the state have been particularly prosperous owing to high priced wool and mutton. Idaho having had so much free summer range has been one of the heaviest sheep producing states in the Union. However, the open range

is getting smaller every year on account of cattle men and homesteaders who are taking up this land. This is making feed for the sheepmen less plentiful and stockmen predict that sheep will never again be as cheap as they have been in the past.

We have forty graduate veterinarians registered under our new veterinary practice act. Thirty are members of the Idaho Association of Veterinary Graduates and fifteen are members of the A. V. M. A. J. R. FULLER.

ONTARIO.

As Resident Secretary for the Province of Ontario, I am glad to be able to report that although there has, during the past year, been an unprecedented movement of United States transit horses for export from the Atlantic seaboard to Europe, there have not been any serious outbreaks of contagious disease.

It has been necessary to unload these horses for feeding and resting purposes at three central points in Ontario, and these operations have been very carefully supervised in order that suitable measures could be taken should disease be detected. At one of these points a few cases of glanders were found. The testing of all contacts and the prompt slaughtering of the affected animals, together with the systematic disinfection of the yards, chutes and corrals prevented any serious trouble developing. There was a fair percentage of cases of shipping fever, which unfortunately always accompanies the movement of susceptible horses. This disease, however, has been practically limited to these shipments, and has not developed into an epizootic among Canadian horses. There is no doubt that this satisfactory state of affairs has been the result of the careful and effective measures which were promptly put into force by the Veterinary Director General when these shipments commenced to come through this country.

Glanders has not been detected in this province to any extent for many years, and there is, therefore, every reason to believe that Ontario is practically free from it.

There have not been as many outbreaks of hog cholera as in the previous year, and those which have occurred have been in districts where uncooked garbage has been fed.

Sheep scab has not been detected for many years in this province, while mange in horses exists only to a very limited extent, and mange in cattle is practically unknown.

There are no statistics which would give a reasonably accu-

rate idea as to the number of cases of bovine tuberculosis in Ontario. Generally speaking, the attitude assumed by stockmen in this province with regard to this disease is not as favorable for the enforcement of effective control measures, as in some of the other provinces of the Dominion. Although the Federal Government passed a Tuberculosis Order a few years ago providing for assistance to municipalities desiring to obtain their milk supply from tuberculin tested cattle, there is not so far one city or town in Ontario which has taken advantage of this very beneficial legislation.

A very few outbreaks of anthrax have occurred, and these have been reported on previously infected premises. These outbreaks are promptly attended to by the Veterinary Inspectors of the Health of Animals Branch, and the owner is advised to vaccinate all contact stock with vaccine prepared at the Biological Laboratory, Central Experimental Farm, at Ottawa.

There has been the usual number of cases of blackleg, but as stockmen have for many years been vaccinating their young animals, the number of fatalities has not been abnormal.

Cases of actinomycosis are reported from all parts of the province.

Serious losses have been experienced from time to time in outlying districts from contagious abortion. This disease is receiving special attention from the officers of the Health of Animals Branch, and one of its pathologists is devoting a great deal of time in research work in connection with it.

Swamp fever has been more or less prevalent in uncultivated low-lying districts.

Joint Ill in foals has also caused a great deal of worry and trouble to the veterinary practitioners located at breeding centers. As many veterinarians are on active service in Europe, the work of the private practitioner has proportionately increased.

Meat inspection is dealt with under the Meat and Canned Foods Act, which is enforced by the Health of Animals Branch of the Department of Agriculture. This, however, deals only with establishments whose business extends to other provinces or to points outside the Dominion. There are eighteen abattoirs in this province in which government inspection is maintained.

During the last few years an increased interest has been taken by municipal authorities with regard to milk inspection.

The majority of municipalities have some sort of milk inspection. Unfortunately, however, this does not go far enough, and is limited to the enforcement of sanitary measures. There is not, so far as I am aware, any municipality in Ontario which requires that milk shall be sold only from tuberculin tested cattle.

While, fortunately, the live stock situation in this province has been very favorable during the past year, I regret very much to report that there has been no improvement in our veterinary legislation.

There are in this province three veterinary associations, the Central Canada with headquarters at Ottawa, the Ontario, of Toronto, and the Kent, Essex and Lambton with headquarters at Chatham. These associations have been united in their efforts, in the last few years, to obtain better veterinary legislation. Two years ago a veterinary bill was drafted, printed and distributed among veterinary practitioners in this province. Copies of this bill were forwarded to the provincial authorities, together with a largely signed petition, and Dr. Grange's assistance was asked for and obtained. Although an extra effort was made to have this bill favorably considered by the Legislature, that body has not so far seen fit to take any definite action with regard to it. This was a very great disappointment to the veterinary profession, as although Ontario is the most important live stock province in this country, it has, with the exception of the Provinces of New Brunswick and Prince Edward Island, the most unsatisfactory veterinary legislation of any province in the Dominion. While Ontario is a most favorable field for veterinary work and is the only province in Canada where a government owned veterinary college is maintained, the present act only provides for the penalizing of individuals who assume the title of Veterinary Surgeon, or any abbreviation thereof. As the other provinces, with the exception of New Brunswick and Prince Edward Island, have adequate veterinary legislation, Ontario is practically the only province which is overrun with unqualified men. It is a well-known fact that there are more unqualified men practising in Ontario than in any other part of Canada.

There is also an institution located at London, which has thrived owing to this unsatisfactory state of affairs. This institution, in spite of the fact that the Ontario Veterinary College is owned by the government, is distributing its fancy so-called di-

plomas steadily and advising its so-called graduates that they can practice in Ontario without fear.

In this connection I might state that I have had the pleasure of forwarding over forty applications for membership to the American Veterinary Medical Association, of which number more than thirty were from veterinarians in the Province of Ontario. I am quite satisfied that the large number of applications was largely the result of the feeling among the veterinary profession in Ontario that it is most desirable to become associated with responsible veterinary bodies in order to receive proper recognition. I think I am voicing the sentiments of the profession when I say that veterinarians in Ontario will remain united until suitable legislation is obtained, and the so-called London Correspondence School is far removed from the borders of this province.

I was very glad to be able to forward to Dr. O. A. Longley, Chairman of the Emblem Committee, suggestions for an emblem, one designed by Dr. E. A. A. Grange, of the Ontario Veterinary Association, and one designed by Dr. C. H. Higgins, of the Central Canada Veterinary Association. GEORGE HILTON.

WASHINGTON

There is not much of interest to report from this state this year. The growing use of the automobile has brought about a great change in veterinary practice in the western part of the state and some change in the eastern part. West of the Cascades, dairying is rapidly supplanting the lumbering business on all the low lands. On the high land the logging is nearly all done with steam power so that equine subjects are not nearly so numerous as they were a few years ago. East of the Cascades there is more interest in the stock raising and horse using industries though the automobile is widely used.

During the past year the state department of agriculture has done a large amount of work in the eradication of tuberculosis from the dairy herds of the state. Our last legislature appropriated $25,000.00 to be used for this purpose. It was not enough but the commissioner in charge realized this from the start and proceeded accordingly so a great deal was actually accomplished with it. A report setting forth the work is to be published soon. It is hoped that the next biennium will see more appropriated and more accomplished. This was the first move of the kind made in this state and it has been a good one.

Interest in association work is about as usual with a few dropping out and younger men taking their places. We had this year the unusual experience of having every attending non-member at the annual state meeting come into the association before he went home and one who could not be present sent in his application by telegraph.

Not all members of the state association are members of the A.V.M.A., but each year sees more of them coming into line.

We are still troubled with a few unqualified practitioners in Washington though we have a practice law that has operated to keep out a large number and has had a wholesome effect on any would-be's.

The bulk of the practice is with the non-contagious diseases as injuries, accidents, obstetrics and digestive troubles. In the eastern part of the state the digestive troubles run largely to impactions while in the western part they run largely to hyperacidity and fermentation. This may be partly accounted for by the fact that east of the Cascades the soil and water carry a good many alkaline elements while west of the Cascades they carry little or none.

Among the contagious diseases tuberculosis, as has already been indicated, has received a good share of attention. Many infected herds have been cleaned.

Rabies that was giving so much trouble in the vicinity of Seattle and Tacoma some time ago is coming under control.

Hemorrhagic septicemia appears to be somewhat on the increase, probably due to the increased number of dairy cattle kept in enclosed pastures.

Verminous bronchitis in calves is also probably increasing. Though the most of the victims survive they suffer greatly and sustain a considerable loss in flesh and strength. More pastures seem to become infested each year.

Hog cholera appears occasionally but is thought by many to be in a less virulent form than that met in the corn belt. The herds are small as a rule and rather widely separated so that the difficulty of controlling them is not so great as in some sections of the country.

Contagious abortion is with us. Dairymen seem to be coming to realize that eternal vigilance and cleanliness is the price of keeping clear of it.

Aside from the contagious diseases mentioned above there are a few worthy of mention in this report.

In the valleys lying between the Cascade mountains and the Columbia river in this state there is a condition of new born animals known locally as "big neck". They come weak or dead with no hair on part of the body and with greatly enlarged thyroid glands. It affects all kinds of live stock if the mothers are there during the full term of pregnancy. No wholly satisfactory form of treatment has been found though some of the sodium and calcium salts have been used with apparent benefit.

A spinal meningitis of horses that appears to be a form of forage poisoning was particularly troublesome during the last fall and winter months. It usually appears in August and September of dry years and again in December, January and February. On this year a similar condition has appeared in cows in some localities. In the cow it is sometimes very difficult to distinguish from milk fever in the first stages. In both species saline purgatives are used early with fairly good results.

CARL COZIER, M. D. C.

SECRETARY'S OFFICE

1827 South Wabash Avenue, Chicago, Ill.

DO YOU SEE YOUR PLACE IN THE NATIONAL DEFENSE?

As the American nation has a just cause to be proud of its people by the way the leaders of industry and commerce have responded to the government's appeal for co-operation in the vigorous prosecution of the war, let every veterinarian see to it that ours is not the one industry that lags behind.

Remember, that men who put national service, of whatever kind, above personal interests during days like these, by placing their knowledge and their skill at the command of the government, leaving all selfish interests in the background, make up an aggregation that spells victory for the nation and honor for themselves.

It is our duty to flag, to country, to home, to profession and to self to improve our collective efficiency by means of a powerful and highly active organization and then to offer its services to the government, promptly, ungrudgingly and enthusiastically. Railway men, manufacturers, merchants, engineers, physicians and others are doing this. What of the veterinarians who fail to support their organizations?

Program of the Annual Meeting

While the finished programme will not be published until the July issue we are submitting herewith a draft of the general plan of the five days' ceremonies together with the numerous papers already offered.

Opening exercises.....Monday morning, August 20th.
Section work (three sections).....Monday afternoon.
Entertainment by Local Committee.....Monday evening.
Section work (two sections).....Tuesday morning.
Business session and election of officers.....Tuesday afternoon.
Reception.....Tuesday evening
Pathological exhibit and luncheon at Kansas City abattoirs
Wednesday forenoon and afternoon.
Meeting of the alumni associations.....Wednesday evening
Section work (two sections).....Thursday morning
Symposium on animal parasites (joint session).....Thursday afternoon.
Banquet.....Thursday evening
General Session for unfinished business and surgical clinic
Friday forenoon and afternoon

Contributions reported to this office to date are:—

Vesicular Stomatitis.....J. R. Mohler, Washington, D. C.
Parasites of Sheep.....A. D. Knowles, Missoula, Mont.
Parasites of Swine.....W. Lester Hollister, Avon, Ill.
Parasites of Cattle.....Seymour Hadwen, Agassiz, B. C.
Parasites of Dogs.....M. C. Hall, Detroit, Mich.
Parasites of Solipeds.....C. P. Fitch, Ithaca, N. Y.
Some of the Problems in the Control of Tuberculosis of Animals
Jacob Traum, Berkeley, Cal.
Advantages of Testing Pure Bred Herds.....S. H. Ward, St. Paul Minn.
The Reliability of the Tuberculin Test
C. J. Marshall and H. W. Turner, Harrisburg, Pa.
Coital Exanthema.....Hal Simpson, Denison, Ia.
Sterility of Mares.....F. F. Brown, Kansas City, Mo.
The Abderhalden Test in the Breeding of Animals..C. A. Zell, Chicago, Ill.
Some Original Methods, Instruments and Operations
Wm. M. Bell, Nashville, Tenn.
The Handling of Dogs.....Arthur Trickett, Kansas City, Mo.
Contagious Abortion (Title to be announced).W. L. Williams, Ithaca, N. Y.
Surgical Treatment of Sterility.....W. L. Williams, Ithaca, N. Y.
Securing Cows for Udder Operations.....J. P. West, Madison, Wis.
Fistulae of the Withers.....H. E. Bemis, Ames, Ia.
Some Hernia Operations.....George B. McKillip, Chicago, Ill.
Special Procedure for Side Bones.....L. G. Hart, Chippewa Falls, Wis.
Illustrated Lecture on the Distribution of the Median Nerve
Jos. Hughes, Chicago, Ill.
Extraction of Molars under "nerve blocking" anesthesia
H. E. Bemis and L. A. Merillat

A New Operation for Recto-vaginal Fistula..R. C. Moore, St. Joseph, Mo.
Operation for Roaring by Special Technique.John Adams, Philadelphia, Pa.
Studies in Blackleg Immunization.....A. Eichhorn, Pearl River, N. Y.
The Regulation of the Production and Sale of Veterinary Biological Products by the Bureau of Animal Industry
J. R. Mohler and A. R. Ward.

Secretary Munce of the Section on Sanitary Science and Police promises additional papers on glanders, hog cholera and anthrax by reporters not as yet selected. There are also some contributions to be added to the symposium on parasitism of domestic animals for Thursday afternoon, and also a number of additions to the section programs.

This thorough review of parasitism by field men who have had a wide experience features the programme this year because its importance is becoming more and more apparent to the live stock industry and especially because it offers such vast fields for investigation. Following the traditions of the A. V. M. A. to dig into the problems of the day the section officers have done well to undertake a systematic study of this important subject, and its presentation in this detail should appeal alike to all sanitarians and practitioners.

The Army Service Committee

Dr. N. S. Mayo represented the Secretary's office at a conference of the Army Service Committee with the Council of National Defense held at Washington, D. C., Sunday, May 13th. The untiring efforts of this committee to obtain satisfactory conditions in the army for the veterinarian (although heretofore unannounced to the membership) is one of the commendable enterprises of the moment, launched into timely activity by our far-seeing President during January, before war was declared. To show the government the needs of a highly efficient veterinary service and to obtain for those who enlist a befitting rank, pay and allowance are among the functions. The personal sacrifices of the members of this committee, in time and money, is a display of patriotism and devotion to the profession that should inspire all to give a helping hand by joining the association.

Rumors that the annual meeting will be postponed on account of the war are unfounded, as this year above all others is one during which the meeting is of great importance. There are so many things to do for the country and for the profession, no matter

how many of our members should be called to the front, that no justification could be found for such a decision.

L. A. MERILLAT, Secretary.

NEW APPOINTMENTS

The special committee of the A. V. M. A. on Army Veterinary Service has been enlarged by the appointment of the following: L. H. Howard, Massachusetts; H. E. Bemis, Iowa; D. S. White, Ohio; A. T. Kinsley, Missouri; S. H. Ward, Minnesota.

Dr. L. Van Es, of North Dakota, has been appointed to the Committee on Intelligence and Education, five-year term, in place of Dr. Ward, resigned.

CHARLES E. COTTON, President.

KEYSTONE VETERINARY MEDICAL ASSOCIATION

The regular monthly meeting of the Keystone Veterinary Medical Association was held in the Chamber of Commerce, Widener Building, on Tuesday evening, May 8th, 1917, at 8:30 P. M. Had an exceptionally big attendance.

The program for the evening was:

The relation of the Dairyman, the State Sanitary Board and the Veterinarian in the matter of the Tuberculin Test, by Dr. Thomas B. Rogers.

A New Treatment of Wounds and Burns by Dr. C. H. Campbell.

The use of the Stomach Tube on Horses, by Dr. William G. White.

Dr. T. W. Munce and Dr. Malcolm J. Harkins were elected to membership in the Association.

Meeting adjourned at 11:30 P. M.

C. S. ROCKWELL, Secretary-Treasurer.

OKLAHOMA STATE VETERINARY MEDICAL ASSOCIATION

The second annual meeting of the Oklahoma State Veterinary Medical Association was convened at the Lee Huckins Hotel, Oklahoma City, May 3rd, 1917, at 9:00 A. M.

This association is the outcome of a consolidation of several local, conflicting organizations, which had attempted to serve the

purpose of veterinary association in this state during the past years. Last year through the untiring efforts of Dr. J. S. Grove, Chief Inspector of the Bureau force at Oklahoma City, and Dr. R. F. Eagle, the enterprising veterinarian who is now General Manager for Wilson & Company and who is probably the highest paid veterinarian in the world, working solely for the uplift of the live stock interests, brought these conflicting organizations together, held a good meeting last July and organized a strong, enthusiastic association that is destined to serve the needs of the state in this connection.

The officers of the association elected at that time and all of whom were re-elected at this meeting are: J. S. Grove, president; J. E. Nance, vice-president; R. C. Smith, secretary; C. C. Hooker, treasurer; L. D. Brown, D. W. Gerber, and W. H. Martin, executive committee.

A survey of the crowd in attendance showed a notable gathering of upward of one hundred veterinarians from the state and the following visitors from remote places: D. M. Campbell, Editor American Journal of Veterinary Medicine, Chicago, Ill.; Adolph Eichhorn, Pathologist of the Lederle Laboratories, Pearl River, N. Y.; J. R. Mohler, Assistant Chief B. A. I., Washington, D. C.; R. F. Eagle, Manager Wilson & Company, Chicago, Ill.; A. T. Kinsley and S. L. Stewart, Kansas City Veterinary College, Kansas City, Mo.; R. C. Moore, President of the St. Joseph Veterinary College, St. Joseph, Mo.; H. Jensen of the Jen-Sal Laboratories, Kansas City, Mo.; and L. A. Merillat, Secretary of the American Veterinary Medical Association, Chicago, Ill. As each of these were active participants in the program the character of the meeting was of the highest order.

The following papers were read and discussed:

Business Methods—D. M. Campbell, Chicago, Ill.

Veterinary Biological Therapy—A. Eichhorn, Pearl River, N. Y.

Tuberculin Testing—A. T. Kinsley, Kansas City, Mo.

Equine Pneumonia—R. C. Moore, St. Joseph, Mo.

Navel Ill—S. L. Stewart, Kansas City, Mo.

Scrotal Hernia and Castration—L. A. Merillat, Chicago, Ill.

Sodium Bicarbonate, Camphor and Lobelia—H. Jensen, Kansas City, Mo.

Equine Influenza—H. W. Ayers, Oklahoma City.

Animal Parasites—E. A. Pembrooke, Stillwater, Okla.

Production and Distribution of Clean and Wholesome Milk—L. L. Lewis, State College, Okla.

Needed Legislation—C. R. Walters, Oklahoma City.

Sanitary Problems—J. R. Mohler, Washington, D. C.

These papers together with the banquet program consumed the time of four day sessions and two evening sessions. The program of the banquet, which proved to be a very sumptuous occasion as well as a patriotic demonstration, was as follows:

Toastmaster—Mr. Ed. S. Vaught, President Chamber of Commerce, Oklahoma City.

Conservation of Livestock.—Hon. Paul Nesbit, Speaker, House of Representatives of Oklahoma.

Elevation of the Profession—D. M. Campbell.

American Veterinary Medical Association—L. A. Merillat.

Preparedness—A. T. Kinsley.

U. S. Bureau of Animal Industry—J. R. Mohler.

Therapeutics—H. Jensen.

Co-Operation—Hon. John Fields.

Reminiscences—R. F. Eagle.

Every one of the toasts were responded to in the patriotic vein seriously calling attention to the duty of every man to his country, during the approaching days of "who knows what". But it was left to Dr. Jensen to display the only simon pure spread-eagleism of the occasion in an address from which Patrick Henry might have taken a cue.

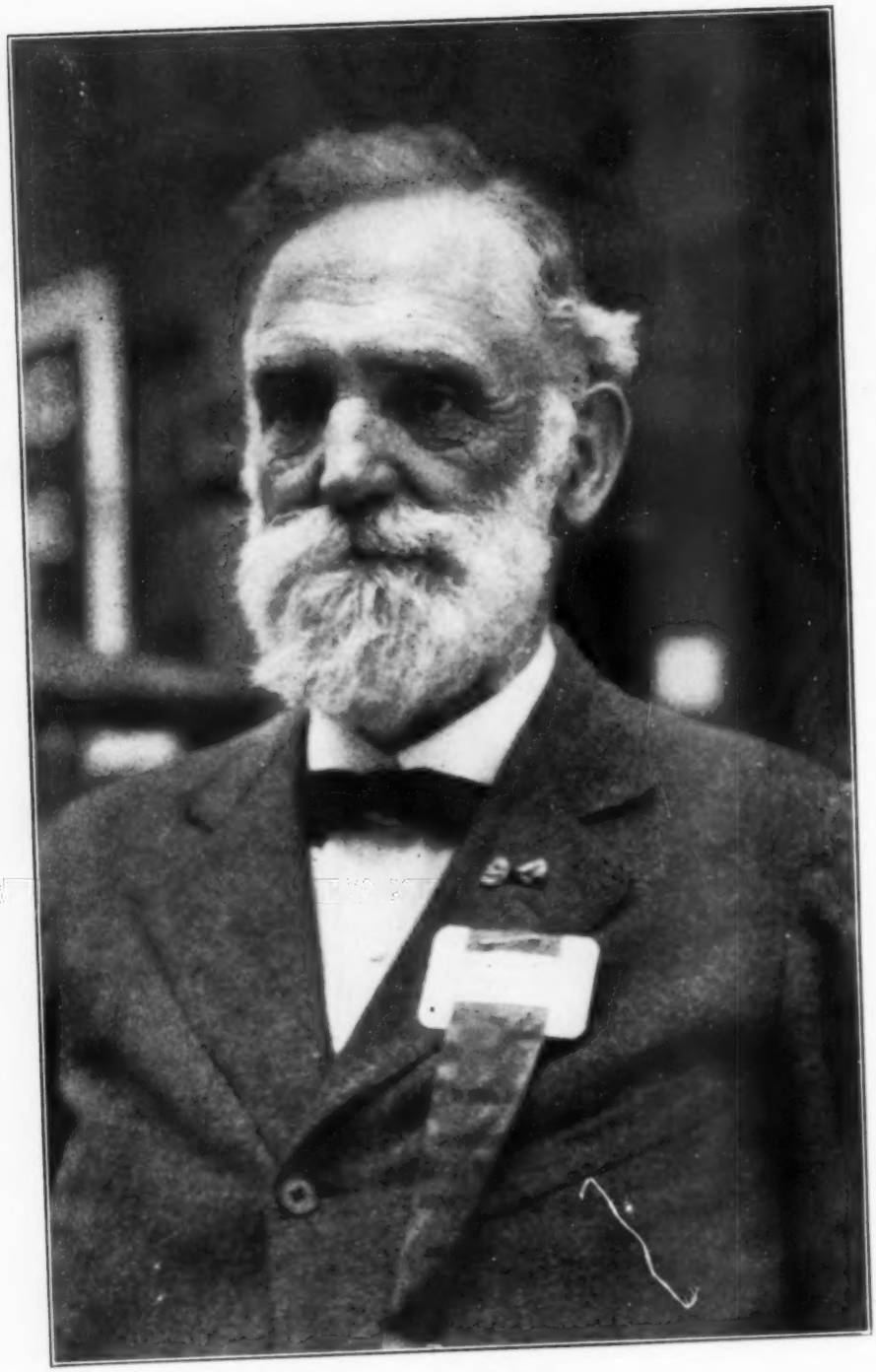
L. A. M.

HUDSON VALLEY VETERINARY MEDICAL SOCIETY

This society held a very successful meeting May 2, at Catskill, N. Y. A large number of interesting cases were reported by various members. This form of meeting met with the approval of the members and it was moved and carried that the same kind of a meeting should be held next time. Senate bill No. 2081 was discussed and it was regularly moved and carried that this society should indorse it. The bill has already passed the senate.

The next meeting will be held August 1, at Chatham, N. Y.

W. H. Kelly, Secretary.



Dr. Cooper Curtice

TESTIMONIAL TO DR. COOPER CURTICE BY THE SOUTHERN CATTLEMEN'S ASSOCIATION

One of the particularly pleasing features incident to the annual meeting of the Southern Cattlemen's Association in Atlanta, April 4-6, 1917, was the testimonial banquet given by a number of veterinarians and others engaged in tick eradication work, to Dr. Cooper Curtice, who discovered the life cycle of the cattle fever tick and demonstrated the possibility of eradicating the ticks.

That work was done in Henderson County, North Carolina, while he was employed by the State in the years 1889 and 1890, and his methods were adopted later by the U. S. Bureau of Animal Industry.

Dr. J. A. Kiernan served as toastmaster and opened the flow of oratory following a feast of good things to eat by saying: "We are here to pay homage to the empire builder of the South. I was one of the first men transferred to Dr. Curtice's force in the year 1906 when the Government inaugurated its tick eradication campaign and made him inspector in charge of tick eradication work in the South, with headquarters at Lynchburg, Virginia. I did not have so much faith in the work then as I have now, but studied the subject carefully and got a lot of inspiration from Dr. Curtice."

Dr. Kiernan then introduced Dr. Tait Butler, who followed Dr. Curtice as State Veterinarian in North Carolina in the year 1891, who said: "As long as veterinary literature lasts, two pieces of work done by Dr. Curtice will stand out in history; establishing the life cycle of the cattle tick, and of the ox warble. It is given very few men to do things that will live long after they die. I would rather have accomplished either one than occupy the highest position in a nation."

Dr. C. A. Cary: "I do not believe there is any permanent immunization of cattle for tick fever. A large per cent of the pure bred inoculated cattle died when I had that work to do in my official capacity and I nearly lost my reputation as a veterinarian. Later I tried tick eradication methods recommended at that time by our friend, Dr. Curtice, which consisted of picking off ticks and greasing cattle. That was awful. We had to approach the people on the blind side of tick eradication by talking

agriculture primarily. Introduction of dipping vats and arsenical solution have solved the problem.

"If the Texas cattle owners had fallen into line 10 years ago and their representatives in Congress had been willing to block interstate shipment of tick infested cattle, the time of country-wide tick eradication work would have been cut in half and we now would be diverting our time and energies to some other phases of live stock sanitation."

Dr. E. M. Nighbert: "My first experiences with cattle ticks were years ago when my father bought 'Southern Cattle' for fattening on cheap corn in the early days in Illinois. However, they were bought late in the fall season and the fat ticks dropped off into the snow and froze to death, so there were no serious losses from tick fever and no parasites reproduced to get on our stock the following spring.

"I was one of the original men assigned by the Bureau of Animal Industry to work with Dr. Curtice, in 1906, after an appropriation had been obtained from Congress. I had been in the employ of the Bureau of Animal Industry some time as a line rider to protect the quarantine line and to supervise interstate movement of cattle at certain seasons of the year, having headquarters at Lynchburg, Virginia.

"The big problem then as well as at the present time, was the people. The early investigators had to work single handed, and Dr. Curtice deserves that much more honor for what he accomplished. I consider that he is responsible for the release of every county which has been released from tick fever quarantine."

Every person gathered around the banquet table made a few remarks on the subject and Dr. Curtice was called upon to tell of some of his struggles and achievements, from his viewpoint. He said in part:

"There were very few supporters of the movement for a long time and practically no funds with which to work. The fertilizer tax in North Carolina furnished limited funds for an educational campaign which was conducted, without which it is doubtful if tick eradication work would have made much progress. Education has been the instrument that moved things. Heart to heart talks hit the nail on the head. One fertilizer manufacturer supported the work because he wanted the farmers to make money on their cattle so they could pay their fertilizer bills.

"The possibility of eradicating ticks was demonstrated in the years 1889 and 1890, but as you know, it was a long time before the Government was convinced of its practicability sufficiently to make an appropriation for carrying on the work. In the meantime the agitation was continued and a few loyal supporters to the movement enlisted, including Dr. Tait Butler, who followed me as State Veterinarian in North Carolina. You all know the progress that has been made since the first appropriation of $82,500 was made by Congress. Some of you may not know that this was made over the protest of the then Secretary of Agriculture, James Wilson, who refused to recommend it, as he was not convinced of its practicability. Later he was a very enthusiastic supporter of the work.

"I am glad that I have been permitted to live and see results. I want to live long enough to see two more projects worked out: eradication of tuberculosis in cattle; and sheep diseases."

After Dr. Curtice had organized the tick eradication work the Bureau transferred him to investigational work which was more to his liking. He had charge of the milk production experiments carried on in Florida which demonstrated that a light infestation of ticks on cows reduced the milk production at least 18 per cent and a heavy tick infestation reduced the milk production as much as 44 per cent. He now is studying sheep diseases and parasites, under direction of the Bureau, on a farm near Washington.

The closing number on the program was the presentation of the following testimonial signed by every one present, each standing as it was read and handed by Dr. Nighbert to Dr. Curtice:

"In recognition of the great service to this Nation by Dr. Cooper Curtice, in his persistent research and discovery of the life cycle of the cattle fever tick (*Margaropus annulatus*), which made possible the complete eradication of this tick from all communities working in co-operation with the cattle owners, counties, State and Federal Governments, which means the development of the cattle industry to an extent that would not have been possible under tick infestations, and which has been an important factor in developing the agriculture of those states, we take this opportunity of expressing our appreciation of his great contribution to the welfare of mankind."

Replying with much feeling, Dr. Curtice said: "Gentlemen, my only regret tonight is that Mrs. Curtice cannot be present to

hear your kind words of commendation of my work, and the reports of great progress that is being made in freeing the infested states of the cattle fever ticks. I thank you from a full heart."

Following are the names of those present, in addition to the guest of honor: Dr. J. A. Kiernan, General Supervisor of tick eradication in the South for the Bureau of Animal Industry, Birmingham, Ala.; Dr. E. M. Nighbert, Inspector in Charge, tick eradication work in Florida for the U. S. Bureau of Animal Industry, Jacksonville; Dr. Wm. Burson, Professor of Veterinary Science, College of Agriculture, Athens, Ga.; Dr. R. M. Gow, State Veterinarian for Arkansas, Little Rock; Dr. W. E. White, Camilla, Ga.; Dr. B. B. Flowe, State Veterinarian for North Carolina, Raleigh; State Representative Lee Cazort, Little Rock, Arkansas; P. N. Little, Live Stock Inspector for Georgia, Lawrenceville; Dr. P. F. Bahnsen, State Veterinarian for Georgia, Atlanta; Dr. Harry C. Hutchins, Assistant State Veterinarian for Georgia, Atlanta; Dr. J. A. Barger, Inspector in Charge of tick eradication work in Mississippi for the U. S. Bureau of Animal Industry, Jackson; Dr. E. P. Yager, Inspector in Charge of tick eradication work in North Carolina for U. S. Bureau of Animal Industry, Washington, N. C.; Dr. R. E. Jackson, Inspector in Charge of tick eradication work in Alabama for U. S. Bureau of Animal Industry, Birmingham; A. A. Coult, Educational Director for the Florida Cattle Tick Eradication Committee of the Southern Settlement and Development Organization, Jacksonville; Dr. W. K. Lewis, Inspector in Charge of tick eradication work in South Carolina for the U. S. Bureau of Animal Industry, Columbia; Dr. A. E. Wight, Inspector in Charge of tick eradication work in Arkansas for the U. S. Bureau of Animal Industry, Little Rock; Dr. C. A. Cary, State Veterinarian for Alabama, Auburn; Dr. G. E. Nesom, in charge Live Stock Extension Work for U. S. Bureau of Animal Industry, New Iberia, Louisiana; Dr. Tait Butler, Editor Progressive Farmer, Memphis, Tenn.; Dr. W. P. Ellenberger, Tick Eradication Division, U. S. Bureau of Animal Industry, Washington, D. C.; Dr. Wm. M. MacKellar, Inspector in Charge of tick eradication work in Georgia for the U. S. Bureau of Animal Industry, Atlanta; Dr. Hartwell Robbins, Veterinary Inspector in tick eradication work, Atlanta; and Dr. H. A. Hirleman, Veterinary Inspector in charge of hog cholera control in Georgia for the U. S. Bureau of Animal Industry, Atlanta. A. A. COULT.

WEST VIRGINIA VETERINARY MEDICAL ASSOCIATION

The West Virginia Veterinary Medical Association met at Parkersburg, April 4th, on call of its president, Dr. Bradley. Dr. S. E. Hershey acted as secretary in the absence of Dr. E. Layne. The purpose of the meeting was to discuss subjects for the betterment of the profession in the State, and make arrangements for their regular meeting which is to meet the first week in July. This association was organized in 1900 with eight graduates, all who were in practice in the State at that time. Dr. S. E. Hershey acted as secretary for the first eight years, then was president for a term of six years, and in that time the membership grew to fifty-six members. At the next regular meeting it is hoped to add at least six more members, as that many new men have graduated from the different colleges this year and located within our State. We hope to get every graduate to join our Medical Association.

S. E. HERSHEY, *Acting Secretary.*

MASSACHUSETTS VETERINARY ASSOCIATION

The regular monthly meeting of the Massachusetts Veterinary Association was held at the Quincy House, Boston, on Jan. 21, 1917. President Peirce presided.

The minutes of the December meeting were read and approved.

As announced previously, the principal speaker was Dr. Langdon Frothingham, of the Harvard Medical School, who spoke on the subject of "Dogfish". His remarks brought out many interesting facts, among which the following are excerpts:

That the dogfish are really small sharks, that there are 180 varieties of such sharks. Speaking of dogfish, he stated that there were two kinds, the so-called smooth and spiny. The spiny form is viviparous, whereas the smooth form is oviparous. The smooth form is the one which is used for food.

Regarding the objection to the use of this fish as food, Dr. Frothingham spoke of the fact that he knew of no reason for the same, inasmuch as they are extremely tasteful and nourishing. Most of the prejudice against the same must be attributed to ignorance. In this respect, he spoke of the time when shellfish would not be eaten, and of the time when halibut were considered as unfit for food. These fish are now called "deep sea whitefish", and

"grayfish", in an effort to overcome this prejudice. Also, the government is endeavoring to make a market for the same, as they did with tilefish, and that many concerns are being established for canning this fish. The prediction was offered that after this prejudice was overcome, the dogfish will be as popular as any other. There is no question of this particular fish being a nuisance, particularly to fishermen, because they spoil large numbers of nets and traps. Inasmuch as they are extremely strong, they tear the strongest nets. It is estimated that the loss to Massachusetts fishermen from destruction of traps and nets is at least $160,000 yearly, and that the loss from other fish eaten by the dogfish is at least $250,000. Dr. Frothingham's remarks comprised one of the most interesting addresses which we have heard for sometime. This was undoubtedly more so on account of the fact that the large majority of us were listening to a subject which we desired to know something about, but on which the majority of us had not the slightest information. A rising vote of thanks was extended to Dr. Frothingham at the completion of his remarks.

The following gentlemen were elected to membership: Dr. John H. Gardner, Wollaston; Dr. Charles W. Delano, Boston; Dr. Herman H. Delano, Jr., Boston.

The secretary spoke of the need of revising the constitution and mentioned the fact that there had been so many amendments to the constitution that it was almost impossible to intelligently interpret the meaning of it. He moved that a committee of three be appointed to revise the same and report to the association. Seconded by Dr. Frothingham. Carried.

Dr. Sturges showed the tongue from a pig which had died suffering with necro-bacillosis infection, which was followed by considerable discussion.

Dr. McAllister, of Lee, chairman of the legislative committee, read several bills which are before the legislature, and which he thought would be of interest to the veterinarians. These were discussed at considerable length. Dr. Howard spoke of the bill which has been introduced calling for the increase in the appraisal for cows condemned on account of tuberculosis, and asked for opinions from those present. Considerable discussion followed, and it seemed to be the consensus of opinion that the appraisement should be increased.

The secretary asked for instruction as to what course he should pursue regarding the money previously voted by the association for the Belgian Relief Fund. He stated that the money was voted with the understanding that it would be forwarded when called for by Dr. Ellis, former Editor of the American Veterinary Review, which is no longer in existence, or when other subscriptions should be made for the same fund, none of which had been noted. It was moved that the secretary investigate the matter further and report back to the association. Adjourned at 7:30.

EDWARD A. CAHILL, Secretary.

SOUTHEASTERN MICHIGAN VETERINARY MEDICAL ASSOCIATION

The second regular meeting of the Southeastern Michigan Veterinary Medical Association was held at the Griswold Hotel, Detroit, on the afternoon of April 11, 1917. Twenty members were present. Four applications for membership were accepted, bringing the roll of the association up to thirty-one members.

Among the questions discussed was the character of the programs for future meetings. In order that the association might be of the greatest good to the greatest number, it was agreed that each member should contribute something to the program of at least one meeting during the year.

A campaign for new members was undertaken, with the object in view to have every eligible veterinarian in Wayne, Macomb and Oakland counties become a member of the association. Every eligible veterinarian who was not a member, about twenty in number, was assigned to a member of the association for the purpose of getting him into the organization.

A question box proved to be a very profitable part of the program. The balance of the afternoon was spent in discussing the treatment of calk wounds, bruised knees, internal abscesses following influenza, and canine distemper.

The next meeting will be held in Detroit, on the afternoon of July 11, 1917. H. PRESTON HOSKINS, Sec'y-Treas.

—Dr. C. W. Clark has removed from Hagerstown, Ind. to Park Falls, Wis.

—Dr. H. W. Bates of York, Ala. has removed to Mobile, Ala.

COMMUNICATIONS

Editor Journal of the American Veterinary Medical Association:
Ithaca, N. Y.

Dear Sir:

The following is an urgent request from the Southeastern States Veterinary Medical Association sent to each member of the executive committee.

RESOLUTION

Whereas, the A. V. M. A. has held but one session in the South, since its organization and whereas the veterinary profession in the South is anxious to have the privilege of entertaining this organization, be it

Resolved, that the Southeastern States Veterinary Medical Association in regular annual meeting assembled, urge the A. V. M. A. to hold its 1918 meeting in the city of Atlanta, Ga. Nothing that the A. V. M. A. could do would have a more uplifting influence on the profession in the South than to grant this, our urgent request.

Motion was made that the Secretary send a copy of the resolution inviting the A. V. M. A. to hold its 1918 meeting at Atlanta, Ga., to the Executive Committee of the A. V. M. A.

Yours very truly,

G. A. ROBERTS, Sec'y.

REVIEW

CITY MILK SUPPLY

HORATIO NEWTON PARKER

Formerly Health Officer of Montclair, New Jersey, lately instructor in Municipal and Sanitary Dairying at the University of Illinois. Member of the International Association of Dairy and Milk Inspectors.

First Edition—McGraw-Hill Book Company, Inc., 239 West 39th St., New York.

In this book the author approaches the milk problem from a little different angle than has been presented in previous publications on this question. The volume seems fully adapted to a study of the milk question and should be a valuable reference book on account of the very complete bibliography on this subject and a large amount of data and information pertinent to the milk business.

The writer's experience as a Health Officer and teacher has brought him in contact with many phases of the milk question. As Health Officer of one of the cities of the United States that has paid as much attention to the milk problem as any municipality in the country, he has had an opportunity to compile data that can be presented in a very logical and useful way.

The first chapter deals especially with the composition, chemistry and bacteriology of milk.

The second chapter discusses the various animal diseases that are communicable through milk, a short description of various diseases, a discussion of tuberculosis and the tuberculin test and other diseases of animal origin. This chapter outlines work that has been done by several authors in a summary way, giving tables and data that have been compiled by various authorities. The second part of this chapter deals with diseases of human origin that may be transmitted through milk by various means and infection, an interesting discussion relative to the various channels of infection and the control of milk-borne diseases and the infection of milk supplies.

The third chapter discusses the various breeds of dairy cattle, the care and housing of animals, barn construction, etc. The more recent work that has been done relative to controlling the spread of various infectious diseases through the medium of poorly constructed stables, the work of detecting open tuberculosis in dairy herds by means of the sputum cup and some of the more recent work along these lines is not referred to.

Under the heading "Sanitary Milk Production" in chapter four, the author considers the various questions entering into the production and handling of clean milk and the effect on the bacteria count of various methods of handling the product, the scoring of dairies and the cost of milk production. This latter question of course varies according to the supply and demand of dairy feeding stuffs, as well as supply and demand in the milk market.

Under chapter five, the various methods of distribution, cost of hauling, the use of motor trucks, etc. are discussed. Cost figures covering these operations are incorporated. Many interesting illustrations in this chapter give an idea of the various conditions under which milk is handled. There are also presented tables showing the relation of proper cooling and low temperatures to bacteria counts.

Chapter six deals with the milk contractor or the milk buyer, a new phase in the literature aside from the daily press and agricultural weeklies, and a considerable portion of the volume is devoted to a discussion of this part of the industry. A great many suggestions are brought out that are of interest and show the figures relating to the various operations in the handling and distri-

bution of milk. These figures, of course, vary in accordance with the price of labor, supplies, etc., and figures that may have been compiled during the past few years are quite apt to be unreliable at the present time, due to changes in the field of labor and in the cost of various supplies, feeds, milk, etc.

In chapter seven, suggestions are made relative to the proper municipal control of milk supplies and ordinances, rules and regulations, etc. are outlined. Rules of production for certified milk, standards of quality and bacteria counts, methods of making the more common chemical tests for butter fat, protein, preservatives, heating, etc. are outlined together with a few tables of vital statistics in child welfare work being incorporated.

The book on the whole contains a great deal of information that is of interest. It should fill a demand that has heretofore not been met in the various publications that have been issued. The references to the literature on the various phases of the milk industry are very complete and the publishers have done their share in making the volume both attractive and useful. C. W.

NECROLOGY

DR. WILLIAM S. POLLARD

Dr. William S. Pollard, of Baltimore, Maryland, died at St. Agnes' Hospital, in that city, April 8, 1917, of Leukemia. He was born in Cheshire, Connecticut, in July, 1877, and attended the public schools of that place. He came to Washington, D. C., where he secured employment as pressman in the Government Printing Office. He studied veterinary medicine at the United States College of Veterinary Surgeons, from which he was graduated in 1906, and soon after graduation received an appointment as a veterinarian in the Bureau of Animal Industry. He was assigned to duty at the National Stock Yards, East St. Louis, Illinois, and was transferred to Baltimore in April, 1907, where he resided until the date of his death.

MISCELLANEOUS

—The next meeting of the West Virginia Veterinary Medical Association will be held July 5 and 6 at Parkersburg. Dr. J. W. Adams of Philadelphia and Dr. L. A. Merillat of Chicago are expected to be in attendance.

—The Bureau of Animal Industry has established a new station at San Angelo, Texas, with Dr. Irving B. Paxton in charge. This station will be the headquarters of veterinarians engaged in eradication of cattle and sheep scabies in the State of Texas. The following inspectors have been assigned to this force: Drs. Calvin S. Evans, Clyde G. Spencer, Charles Pearson, Louis L. Jones, William E. Dodsworth, Clifton Carter and Irwin E. Barr.

—The vacancy caused by the resignation of Dr. George H. Hart from the Board of Health at Los Angeles, California, has been filled by the appointment of Dr. Maynard Rosenberger, who has resigned from the Bureau of Animal Industry to take up this work.

—A new meat inspection station of the Bureau of Animal Industry has been established at Madison, Wisconsin, with Dr. Simon S. Snyder, formerly of Menominee, Michigan, in charge. Dr. Edward C. Carle succeeds Dr. Snyder as inspector in charge at Menominee.

—Dr. Howard M. Batchelder, for 18 years an inspector in the Bureau of Animal Industry, has resigned to give his attention to personal business and property interests in the vicinity of Sterling, Colorado.

—Dr. R. M. Weightman of Waterville, N. Y. is convalescing from an automobile accident in which he suffered a fractured jaw.

—Dr. H. R. Groome of Jewel City, Kans. has sold his practice to Dr. Harve Frank, a graduate of the Veterinary College at Manhattan, Kans. Dr. Groome and his family have removed to Twin Falls, Idaho. The *Jewel County Republican* states that, in his ten years residence, Dr. Groome, by studious habits, hard work and honorable methods had built up an extra good practice.

—Dr. R. J. Donohue, formerly of North Yakima, Washington, has been appointed Assistant Commissioner of Agriculture, Division of Dairy and Livestock with headquarters at Olympia, Washington.

—Plans are being made in Philadelphia, Pa. to form a branch of the Red Star Animal Relief of the American Humane Association, in connection with the war.

—Dr. E. B. Parker has removed from Bogota to Louisville, Ill.

—Dr. M. J. Williams, of the Bureau of Animal Industry, is located at Magnolia, Ark., for field work in tick eradication.

—The death of Emil von Behring, of the University of Marburg, is announced. As a result of his discovery of the diphtheria antitoxin numberless lives have been saved. Von Behring also turned his attention to the problem of eradicating tuberculosis and emphasized the importance of preventing tuberculous infection in infancy. Subsequently he devised a method of bovovaccination and vaccination with a special tuberculin, but neither of these withstood the test of practical experience.

—According to newspaper dispatches Dr. A. T. Peters of Peoria, Ill, has been appointed State Veterinarian to succeed Dr. O. E. Dyson.

—At a recent meeting of the Rotary Club, Easton, Pa., Dr. C. B. Palmer gave a strong address on the growth and advantages of the veterinary profession.

—Two New Divisions in the Bureau of Animal Industry. Two new divisions have been created in the Bureau of Animal Industry. One is the Tuberculosis Eradication Division with Dr. J. A. Kiernan as chief; the other is the Tick Eradication Division with Dr. R. A. Ramsay as chief. The changes became effective May 1. The Tuberculosis Eradication Division, one of the newly created agencies, will have charge of the work of testing cattle to determine the presence or absence of tubercular infection. This work has been greatly expanded by a recent appropriation by Congress. The second new agency, the Tick Eradication Division, will be devoted exclusively to the work of eradicating the cattle fever tick in the South. The changes will leave the Field Inspection Division, which now handles most of this work, free to devote itself to the enforcement of cattle transportation laws and the combating of miscellaneous animal diseases. This division will have charge, as in the past, of the work of conducting the campaigns waged by the Department of Agriculture against outbreaks of animal maladies, such as foot-and-mouth disease. Dr. Robert A. Ramsay, Chief of the Field Inspection Division, will become Chief of the Tick Eradication Division.

Dr. Arthur W. Miller, also a veterinary inspector of the Field Inspection Division, will become Chief of that division, while Dr. R. W. Hickman will continue as Chief of the Quarantine Division.